ZX COMPUTING MONTHLY

An Argus Specialist Publication NOVEMBER 1986 £1.50

FOR ALL SINCLAIR USERS

REVOLUTION
grips the Spectrum

SOUNDTEST:
SOUND SAMPLER
THE MUSIC MACHINE

QL ERROR TRAPPING
JOYSTICK SPECIAL

MONSTER HITS! ◆◆ Dan Dare ◆◆ The Trap Door ◆◆ Cyrus II

WIN! ◆ Saga Campliment ◆ Level 9 Yearplanners ◆ Gremlin Clacks


THANATOS
Spectrum in October, Amstrad in November, Commodore 64 in December.
All £8.95
DURELL
Sales dept.,
Castle Lodge, Castle Green,
Taunton, Somerset TA1 4AB
England
software getting harder . . . .

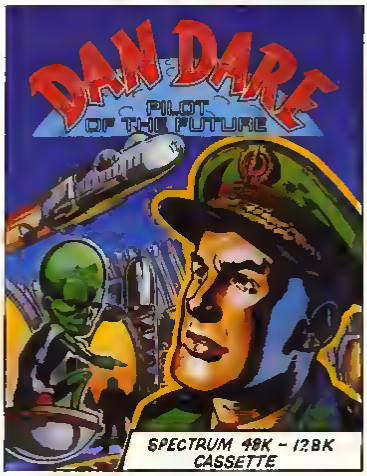
CONTENTS

FEATURES

REGULARS

COMPETITIONS

SOFTWARE REVIEWS



Dan Dare reviewed (46)

PROGRAMMING PROJECTS

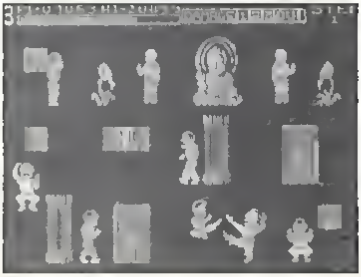
The Pilot of the Future in action (46)

NEWS

Fairlight II

Bo Jangeborg's follow up to Fairlight is now almost complete and due for an October release. Fairlight II carries straight on from where the action in Fairlight left off. But now, the game's hero, Isvar, has to leave Castle Fairlight and travel through a forest beset by the powers of Darkness. The Edge claim that this will be one of the first 'true' 128 games for the Spectrum and the 48K version will have to be loaded in two parts in order to fit into the smaller memory. Both versions will cost £9.95.

Also due from The Edge this month are Shao-Lin's Road, an arcade conversion of the sequel to Yie Ar Kung Fu, and The Artist II. The latter is an upgraded version of the rather nifty Artist, which was also programmed by Bo Jangeborg, and includes many new features such as pull down menus, icons, AMX and Kempston mouse control and lots more. As with Fairlight II, The Artist II will be available in 48K and 128K versions for £14.95 and £17.95.

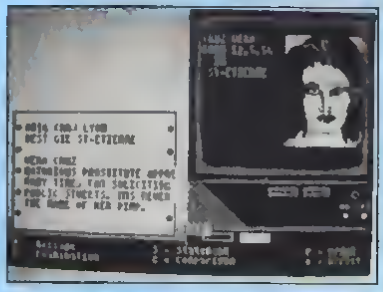


Shao-Lin's Road

The French Connection

Vera Cruz is an interesting new game from French company Infogrames. The aforementioned Vera is, or rather was, a well known woman of ow-you-say easy virtue. Until she was discovered dead in her apartment — which is where you come in.

Using a police computer system to gather information you must piece together clues to solve the murder and apprehend the villain. But first you have to track the game down in your local software shop and bribe the owner with £9.95 before you can get on the trail.



Codemasters

This little bunch of Darlings (Jim, David and Richard) are collectively known as Code Masters, which is the name they've given to their new budget software label. Jim Darling used to work for Al Products who have provided many of Mastertronics titles in the past, and his two sons have programmed a few games, such as the well known The Last V8, Masters of Magic and others.

Code Masters intends to release games as good as most full priced titles, but at a competitive £1.99. Their first Spectrum titles include Vampire (platform game with a difference), Phantomas, a graphic adventure called Necris Dome, and Terra Incognita, the follow up to Mastertronics odd game Nonterraqueous. Let's hope that those four get Code Masters off to a good start.

Opus meet the Plus 2

Opus Supplies wish to announce that yes, the Discovery disc drive is compatible with the new Spectrum Plus Two. Risking potential egg on face of mega proportions, Opus John Harris tried out the new Spectrum when it went on show for the first time at the PCW show and everything went fine. So Plus 2 owners looking for a disc system and not wanting to wait for the rumoured Amstrad system need look no further!

Discovery cost £99.95 plus VAT, and Opus can be contacted on 0737-65080

Gratuitous violence

That's our only excuse for printing this picture of judo fiend Brian Jacks beating the daylights out of his poor old dad. That and the upcoming release of the judo simulation Uchi Mata from Martech on whose stand the two Jacks were demonstrating a few throws at last months PCW show.

We would like to point out that ZX doesn't necessarily condone the mugging of ones father, though you have to admit that it's one way of getting him to go out and buy you a new Spectrum Plus 2.

Spectrum Games Top Ten

1	( )	Trivial Pursuit	Domark
2	( )	Dan Dare	Virgin
3	( )	Headcoach	Addictive
4	( )	Paperboy	Elite
5	( )	Dragons Lair	Software Projects
6	(2)	Ghosts 'n Goblins	Elite
7	( )	Heartland	Odin
8	( )	Xarq	Electric Dreams
9	(4)	Green Beret	Imagine
10	( )	Strike Force Harrier	Mirrorsoft

(Chart supplied by W.H. Smith)

All change at the top with some heavyweight releases this month. The question is can any game displace Trivial Pursuit before it comes into its own as the latter made software stocking filler?

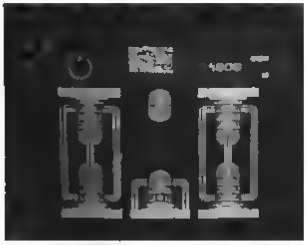
Strong contenders for the Christmas No 1 spot yet to be released include Gauntlet, (US Gold), Uridium (Hewson) and Trailblazer (Gremlin).

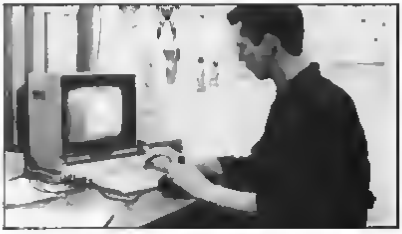
Now!

Virgin have just put together the third in their Now Games series. Now Games 3 is a compilation of five games, including a brand new Spectrum version of Sorcery which is available for the first time. The other titles on the tape are Nick Faldo Plays The Open, Codename Mat II, Everyones A Wally and the three part Bond Game, A View To A Kill. Now Games 3 should be in the shops as you read this, and costs £9.95

At last, Antiriad

Despite a few last minute hitches, Palace Software's newie, The Sacred Armour of Antiriad should be released this month. This epic of barbarians and nuclear holocaust has already been previewed in ZX, so we will only add that the release date is 23rd October and the price £8.99





Dan Malone. Antiriad's author hard at work on the graphics using a barbarian machine

Editor: **Bryan Ralph**
Assistant Editor: **Cliff Joseph**
Consultant Editor: **Ray Elder**
Advertising Manager: **John McGarry**

Design: **Argus Design**
A.S.P. Advertising and Editorial
No. 1 Golden Square, London W1R 3AB 01-437-0626

Printed by Alabaster Passmore and Sons Ltd. Tovil, Maidstone, Kent
Advertisement Copy Controller: Andy Selwood
Distributed by: Argus Press Sales and Distribution Ltd. 12-18 Paul Street, London EC2A 4JS

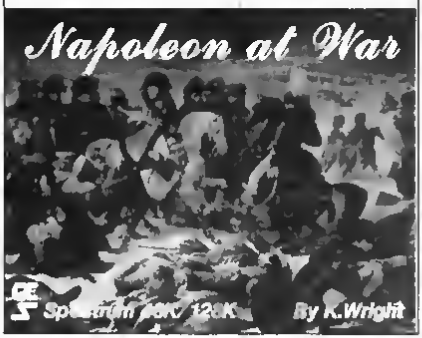
ZX Computing Monthly is published on the fourth Friday of each month. Subscription rates can be obtained from ZX Subscriptions, Internet Times House, 179 The Marlowes, Hemel Hempstead, Herts HP1 1BB.

Not tonight Josephine...

is a new strategy game in which Napoleon Bonapatte attempts to ——— no, lets try that again

Napoleon At War is the latest release from wargames specialists CCS Based upon the Battle of Eylau the game puts you in control of French troops as they battle the opposing (computer controlled) Russian and Prussian forces. CCS say that the game offers a high level of artificial intelligence, both in the computer opponent and in suggesting alternative tactics for your own forces, so if you re into wargames this is your chance to meet your Bakerloo for £8 95

Further strategic info from CCS on 01-858-0763



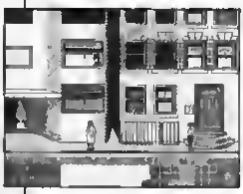
Once bitten...

Twice Shy is the latest game from Mosloc, based on the Dick Francis horse racing thriller of the same name. In it, you ll play the part of teacher Jonathan Derry who finds some computer tapes that are wanted by shady underworld figures, and it s up to you to get the tapes back to their rightful owner

The game is being written by The RamJam Corporation and is priced at £9 95 So if you fancy thrilling some race horses Twice Shy seems like a good bet

Cruising

Microsphere the software house that brought you Skool Daze have been quiet of late but are about to surface again with a detective mystery game called Contact Sam Cruise Sam Cruise is a private eye in the Bogart tradition with a permanently turned up collar Microsphere are keeping shtumm about the plot thus far but here's a screenshot to get you into that "film noir" mood



Software Pirates

Ariolasoft offer you the chance to plan the crime of the century in their new game. They Stole A Million, in November You are put in charge of a group of small-time villains and with the help of some blueprints and your handpicked henchman you can choose one of five "targets" to rob and then you've got to find yourself a fence who can take the merchandise off your hands If this sounds like your sort of thing, then beg borrow or possibly steal £8 95 to get the goods from Ariolasoft

Professional Retouch

Part of the listing in The Professional Touch (September) was printed out of sequence. The section of the listing C125 to C177 should be moved to the end of the listing

Mantronix winners

The winner of our Inlay design competition is 17 year old Ian Macaulay from Dudley who sent in an impressive redesign of Probe Software's Mantronix cover. Ian's winning entry was very professionally presented and he gets the chance to see the professionals at work with a visit to Probe as they work on the theatrework for a new release.

Mr D Nichols from Holborn E. Bennet from London SW11, Jay Sachania Milton Keynes and David Rademaker from Gent Belgium win runners up prizes of a copy of Mantronix

Elite Classic Winners

The winners carry off the first ten releases in the Elite Classics range. They are Tommy Tay, Oberursel West Germany, Jeffrey Ford Etwall Tony Parrill Cleveland Richard Haggis, London N3 and Cleasie Ward, Spilsby

Graphic Adventure Creator Winners

ZX readers plumbed the depths of their imaginations to summon up the opening scenes of a new adventure and the results showed some fine sparks of originality Ten winners get the chance of developing their ideas into a finished product with Incentive's Graphic Adventure Creator They are Pete Painton, Walsall Jorgen Jacobsen, Glostrup, Denmark A F Molin Leeds J S Russel Fareham, Barry Carter London E 2, D M Shannon Co Antrim W J Stewart Nottingham Emil Gruber, Graz, Austria, P Newnndm, Weston Super Mare, Roger Morton Normanton

Boggit Winners

Thirty ZX readers have booked their trip to the wacky land of enchantment Muddle Earth by emerging the victors in our Boggit competition They will each receive a copy of CRLs Monster Hit game and set off on this spoof adventure to discover the dreaded horrid squelchy things and other beings that Tolkien thought were too funny to include in the original

The squad of winners are H H Neilson Gakashields P Gaw Normanton Brett Coles, Milton Keynes, Miss E Dron, Sutton, Trevor Boyd Belfast, Geoffrey Priced Fulborough J Riddell, Herne Bay Richard Grant West Lothian Leif Karnstaedt Colommieres France Javier Packer Coryn Court St Etienne, France, PR Ball Brentwood, P.J. Nutter, Catterick A.L. McLellan Paisley P.J.E Williams, Fordingbridge S. Burnett Tottenham Mrs P Barclay Plymouth, Gregory Teeger London NW6 Colin MacKenzie, Fleet D.J. Wagner London W3 Sean Weekes, Sandiacre, Mark McEvilly Birmingham Phillip Hiscock Shepton Mallet John Jones, Lochlade N.S Collet BFPO 34 N Cashman London E14, P Harrison Appleby, R Record, Clacton, David Watson, Ramsley Dirk Vanderrayken, Heverlee, Belgium Skanomir Kais, Myslavokice, Poland.

24 HOUR COMPUTER REPAIRS and COMPUTER SPARES

HOW TO GET YOUR SPECTRUM REPAIRED FOR ONLY £19.95

SPECIAL OFFER!

We are [illegible] the fantastic DK'Tronics Spectrum keyboard for only £31.00 including mining VAT and return post and packing

Normal recommended retail price £49.95 Replacement product DK'Tronics key only £7.50 including post & packing

SPECIAL OFFER!

Why not upgrade your Sinclair Spectrum to a 48K for as little as £17.95 including VAT and packaging. If you wish, keep your old rubber key board and we will pay you just send us £19.95 which is a fully inclusive price to upgrade at home including return postage

Full fitting instructions supplied with every kit. Issue 3 and 2 only.

TEK to 48K UPGRADE KIT

Update Your Rubber Keyboard to a New Spectrum+

Fitted for only £29.95 + £1.50 post & packing

(Also D.I.Y. Kit available for only £23.00 + £1.50 p & p)

Same day service LIMITED OFFER

TRADE REPAIRS Contact Manchester

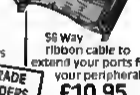
TEN ★ REPAIR SERVICE

- While you wait service including computer spare parts over the counter
- All computers fully overhauled and fully tested before return
- Fully insured for the return journey
- Fixed low price of £19.95 including post packing and VAT (Not a between price of repairs up to £30.00 which some of our competitors are quoting)
- Discounts for schools and colleges
- Free top gamer worth £33.00 for you to enjoy and play with every Spectrum repair
- We repair Commodore 64's, Vic 20's, Commodore 16's and Plus 4's
- The most up to date test equipment developed by us to fully test and find all faults within your computer
- Keyboard repairs Spectrum rubber key boards only £9.95
- 3 month written guarantee on all repairs

BEST SERVICE — BEST PRICES!

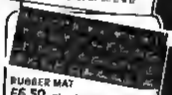
EXTENSION RIBBON

KEYBOARD TEMPLATES £5.50 plus £1.50 p & p



50 way ribbon cable to extend your ports for your peripherals £10.95 plus £1.50 p & p

TRADE ORDERS WELCOME



RUBBER MAT £6.50 plus £1.50 p & p

ARE YOU ANOTHER CUSTOMER - fed up waiting weeks for your estimate?

Need your computer repaired fast? Then send it now to the Number One Repair Company in the U.K. or call in and see us at our fully equipped 2,500 square foot workshop with all the latest test equipment available. You are more than welcome. We will repair your computer while you wait and help you with any of your technical problems. Commodore computers repaired for only £35.00. Please note we give you a 100% NW fixed price of £19.95 which includes return post and packing, VAT, not a between price like some other Repair Companies offer. We don't ask you to send a cheque in for the maximum amount and shock you with repair bills £50.00 upwards. We don't just repair the fault and send your computer back. We give your computer a

FREE OVERHAUL WITH EVERY REPAIR WE DO.-

We correct Colour, sound, keyboard, check the loading and saving chip, put new feet on the base if required. Check for full memory, check all sockets including ear/mike and replace where needed. All for an inclusive price of £19.95 including VAT, all parts, insurance and post and packing. No hidden extras whatsoever. We don't have to boast too much about our service as we have thousands of customers from all over the world highly delighted with our service. A first class reputation for speed and accuracy. Don't forget we also now have a Service Branch in Manchester City Centre for while you wait service.

NEW

SPECIAL OFFER!

Commodore computer power transformer suitable for Vic 20 and 64 models. Special price of only £16.95 including p & p

Modem available at separate cost £10.95 plus interface available at separate cost £9.00 plus £1.50 p & p

REPLACEMENT POWER SUPPLY

Spectrum replacement power transformer suitable for all makes of computer £9.95 plus £1.50 p & p

2X81 SPARES NOW IN STOCK

Spectrum keyboard membranes £5.50 plus £1.50 p & p

Spectrum Plus spare keyboard membranes £12.50 plus £1.50 p & p

2X 81 membranes £5.00 plus £1.50 p & p

KEYBOARD MEMBRANES

COMMOOORE POWER SUPPLY

Commodore replacement power transformer £29.00 plus £1.50 p & p

ORDER NOW!

VideoVault D.I.Y. CORNER

We regret we cannot show all the components available. Just give us a call and we can quote you over the phone. Delivery by 1st class post.

SPECTRUM SPARES	
Z80B C.P.U.	£ 3.00
6116 Ram	1.00
ZTX650	0.80
ZTX213	0.80
Power Supply Transformers	5.95
ULA 6C001	16.00
Roms	14.00
Keyboard membrane Spectrum	5.50
Keyboard membrane Spectrum Plus membrane	12.50
Metal Templates	5.50
Keybmat Mats	5.50
2X81 membrane	5.00
Service Manual	£50.00

COMMOOORE SPARES	
6526 – C.I.A.	19.00
6510 – Processor	19.00
6581 – Sid Chip	19.00
906114 – House Keeper	19.00
901125 – Graphic Rom	19.00
901226 – Basic Rom	19.00
901227 – Kernal Rom	19.00
6568 – VIC	19.00
4164 Rams – Memory	5.00
Power Supply Transformers	29.00

All our prices include VAT, but please add £1.50 on each order to cover post packing and handling charges.

VIDEOVAULT HEALTH WARNING!!!

— Sending your computer to any other Repair Centre can seriously Damage its Health

FULLY REPAIRED AND TESTED ON MOST ADVANCED TEST EQUIPMENT IN EUROPE!

VideoVault Ltd

Telephone (STD 04574) 66555/67761 Glossop
061-236-0376 Manchester Branch

OPEN 7 DAYS A WEEK MANCHESTER (MON - SAT ONLY)

SPECIAL OFFER 5 GREAT FREE GAMES

NORMAL RECOMMENDED RETAIL PRICE £33.00 YOURS FREE WITH EVERY SPECTRUM REPAIR

COMPLIMENTS OF SAGA

COMPETITION

Your chance to win a complete word processing set up from Saga worth over £300.

Saga Systems has put together a word processing package aimed at giving Spectrum owners a viable alternative to the temptations of the Amstrad PCW8256. Known as the Compliment it will be selling at £299+. That's £100 less than the Amstrad word processor. But the Compliment is made up of hardware that can be used for many other uses — it's far more than just a word processor.

The Prize

The Compliment consists of:
LQ Printer — prints 150 characters per second and 25 characters per second in LQM and also features an Epson compatible character set
Parallel printer interface
Saga +2 Keyboard
Opus Discdrive
Last Word Software
Software Extention — includes foreign character sets
Mailmerge

Compliment Competition

I would like to win the Saga Compliment because (in 50 words or less)

Name

Address

Post to Compliment Competition, ZX Computing Monthly, No 1 Golden Square, London W1R 3AB.

The competition

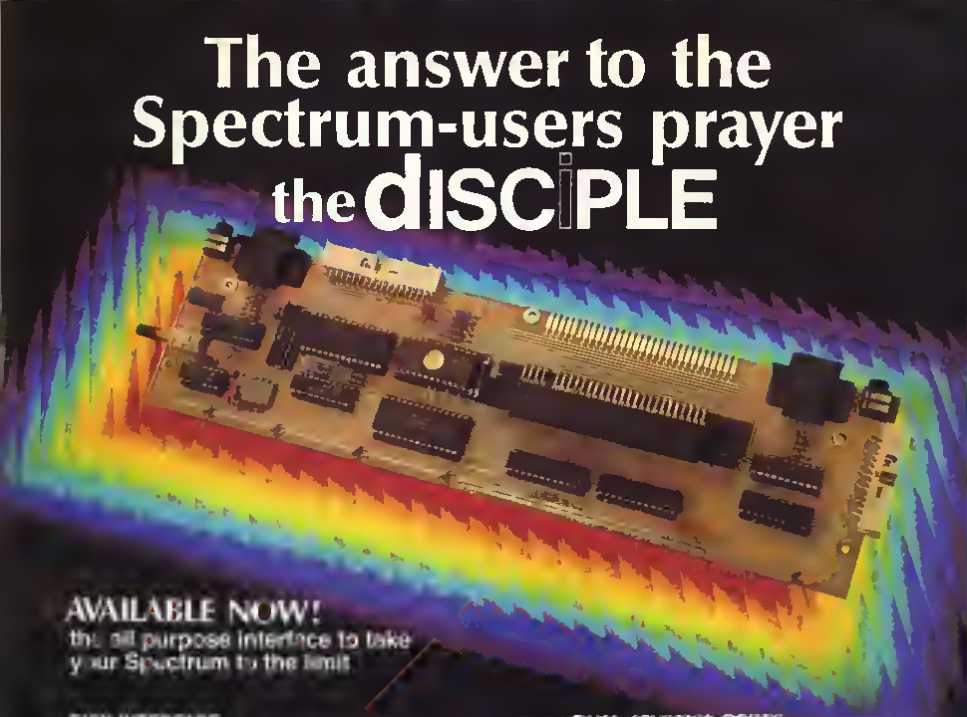
In conjunction with Saga, ZX is giving one of its readers the opportunity to win a Compliment system. All you have to do is give us in 50 words or less your reason for wanting to win the Saga Compliment.

The competition is open to all readers of ZX except employees of Argus Specialist publications, Alabaster Passmore and Saga Systems. The editor's decision is final and no correspondence can be entered into. The closing date is December 5th 1986.

Fill out the coupon below and post to Compliment Competition, ZX Computing Monthly, No 1 Golden Square, London W1R 3AB.

The answer to the Spectrum-users prayer

the DISCIPLE



AVAILABLE NOW!

the all purpose interface to take your Spectrum to the limit

DISK INTERFACE

- Allowing up to 127 Mbytes of storage on 2 drives
- Uses a full 8K on board in 3 basic modes
- Simple basic syntax
- Compatible with any standard drive – single or double density, single or double sided, 40/80 track, 3", 3½", 5¼"

SNAPSHOT BUTTON

- Saves any program instantly – at any point you wish and as often as you like

PRINTER INTERFACE

- Compatible with the whole range of Centronics parallel printers
- Uses normal Basic commands – LLIST, LPRINT, COPY
- Includes user friendly software package

DUAL JOYSTICK PORTS

- Sinclair and Kempston – simultaneously

NETWORKING

- Operating system allows Disciple to act as the server station in a local network and two drives for up to 64 Spectrums
- Interface 1 compatible

Use the disciple with any Spectrum – even the new Plus Two model.

the DISCIPLE

the ultimate disk, printer, joystick and network controller for the Spectrum **£73.70** (+VAT)

Designed by Miles Gordon Technology for Rockfort Products (a trading division of Vignesh Ltd)

For more information call us on 01-203 0191 or visit our London showroom for a demonstration

To: Rockfort Products, 81 Church Road, London NW4 4DP
Please send me POST FREE _____ (Quantity) DISCIPLE Interfaces
@ £84.75 each, including VAT & P&P

I enclose CHEQUE/POSTAL ORDER for £_____

OR debit by ACCESS ☐ or VISA ☐ *(tick as appropriate)*

CARD NO ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

EXPIRY DATE _____

SIGNATURE _____

NAME *(Block Capitals)* _____

ADDRESS _____

_____ Postcode _____

Overseas orders and trade enquiries welcome. Telex 946240 Ref. 190-12450

the war of

WARGAMES

Alan Davis begins a three part series to create an original fantasy wargame.

[illegible]


elve shires
high-life
little
meadows
clear-
water
east-
lands

the shires

the war of the shires

Don't worry — you haven't bought a role-playing fantasy magazine by mistake! This really is ZXC Monthly, and what you've just read is the introduction to a computer game. I'd better explain.

It all began with a bit of doodling, really. With pen and paper to hand one morning I started sketching out a map of an imaginary world, with nothing very particular in mind — not knowing where it might lead. Gradually the map took shape, dividing itself interestingly into twelve Shires. Each Shire acquired a keep and a sprinkling of villages, and of course these in turn required inhabitants. So I started inventing some characters — thanes of the Shires, Roland of Greenways, Ranolf of Deepmeads, and so on.

Now, someone (C.S. Lewis, I think) once commented that imaginary worlds are all very well, but when you've created this interesting place and populated it with characters, something has to *happen* in it! It was at about this stage that I began to realise that there were possibilities here for a computer game of the "fantasy-epic-wargame" variety, which might provide some interesting programming examples (as well as an entertaining game) for my friends the readers of ZXC — not to mention myself! So I discarded the pen and paper plugged in the old Spectrum — and the eventual result was "THE WAR OF THE SHIRES".

Building a world

Right at the start, a number of decisions had to be made about the format of the game. At first I did briefly consider using a simplified form of landscaped graphics, but rejected the idea on the grounds that the sheer volume of graphics data would make the program listings ridiculously long. However, there seemed to be no reason why the original 'world map' itself couldn't be represented graphically — so I settled for that. The next question concerned the actual programming, which, ideally, should be sufficiently flexible for others to modify and add developments of their own. I could see from the start that *some* machine code programming would be necessary to prevent ponderous response times, but I was surprised to discover that in practise only two machine code routines were strictly necessary, and that BASIC was perfectly adequate for everything else.

Now this is good news, because of course it's very much easier to experiment with changes in a BASIC program than it is with machine code. The final requirements was merely that the game should be fun to play in its own right, regardless of any further developments you might like to make yourself in due course.

So if, as I am, you're attracted by the idea of creating imaginary worlds, or if you have a taste for the "Lords of Midnight" type of epic fantasy game which can be played over and again in different ways, or if you just fancy tackling the interesting programming challenges of a strategy game — why not join me for the next couple of months, and try writing your own ?

LISTING 1
Map printing routine: Assembler program

```
#NISOFT DENSHIE ASSEMBLER,
        ZX SPECTRUM

Copyright (C) NISOFT 1983,4
All rights reserved

Pass 1 errors  00

                        10 s0+
                 20 rC
                 30 PRMP
60000  40                ORG  60000
60000  50                LD   A,2
60002  60                CALL 8160L
60006  70                CALL 2040B
60008  80                LD   A,2
60010  90                CALL 8160L
60013  100               LD   HL,(VARS)
60016  110               LD   DE,0
60019  120               ADD  HL,DE
60020  130               PUSH HL
60021  140               LD   DE,704
60024  150               ADD  HL,DE
60026  160               EX   DE,HL
60026  170               POP  HL
60027  180 START         LD   B,32
60029  190 LOOP          LD   A,16
60031  200               RST  16
60032  210               LD   A,(HL)
60033  220               LD   (CHR),A
60036  230               CALL COLOUR
60039  240               RST  16
60040  250               LD   A,(CHR)
60043  260               RST  16
60044  270               INC  HL
60045  280               DJNZ LOOP
60047  290               LD   A,E
60048  300               CP   L
60049  310               JP   NZ,START
60052  320               LD   A,D
60053  330               CP   H
60054  340               JP   NZ,START
60057  350               RET
60058  360 COLOUR        CP   144
60060  370               JP   Z,BLUE
60063  380               CP   146
60065  390               JP   Z,GREEN
60068  400               CP   146
60070  410               JP   Z,CYAN
60073  420               CP   147
60076  430               JP   Z,GREEN
60079  440               CP   148
60080  450               JP   Z,RED
60083  460               CP   149
60085  470               JP   Z,HAGE
60088  480               CP   150
60090  490               JP   Z,GREEN
60093  500               CP   151
60095  510               JP   Z,GREEN
60098  520               RET
60099  530 BLUE          LD   A,1
60101  540               RET
60102  550 RED           LD   A,2
60104  570               RET
60105  580 HAGE          LD   A,3
60107  590               RET
60108  600 GREEN         LD   A,4
60111  610               RET
60112  620 CYAN          LD   A,5
60114  630               RET
60115  640 CHR           DEFB 0
63057  650 VARS          EQU  63057

Pass 2 errors  00

BLUE    E064    CHR     2003
COLOUR  E058    CYAN    E060
GREEN   E0CD    LOOP    E029
HAGE    E0C0    PRMPP   07F4
RED     E0B7    START   E027
VARS    F5B8

Table used     137  from   194
```

Maps and things

This month, as you might hve guessed from the illustrations, is mostly about graphics and maps — specifically, the business of transiating the original map of the Twelve Shires into something that can be readily programmed on the Spectrum. The Spectrum upper screen, as you know, consists of 22 rows of 32 character squares. Suppose we let each of these character squares represent one location on the map of the world, then. This will give us 704 locations to play with — which should give ample scope for our "mini-epic", and will enable us to display the entire worldmap on screen at once.

But how should we store such a map in memory? One method would be to draw it out on screen, and then store the entire screen as a code block above RAMTOP, calling it up as required during the game using a short LDIR-based machine code routine. Well, if the map were to remain unchanged during play, this would be fine — but in "The War of the Shires" I wanted certain features of the map to be altered by events. (Ships, for instance, won't always be in the same place, and keeps may be reduced to rubble in battle.) I finally decided to store the map in a BASIC character array x$(22,32), so that each character square on the screen could be directly related to a single element of the array, for ease of manipulation. Mountains, keeps, and so on, could then be represented by UDGs on screen, with the codes for the UDGs being held in the array.

So how do we actually get the map onto the screen, with each UDG appearing in its correct colour? Well, it *could* be done in BASIC — but it's a painfully slow process which would drive any player of the game to distraction (in play, the game involves a good deal of swapping between the map and the various text "pages" dealing with battles and the like). This, then, *must* be a machine code job — and the assembler program in Listing 1 will do it for us. It's a very simple routine which assumes that the array x$(22,32) is stored at the *beginning* of he BASIC variables area, and is simply prints the 704 characters contained in the array in the appropriate INK on white PAPER. I must emphasise that the routine won't work if the array x$() isn't at the start of the variables area. This means that either the array must be dimensioned before any other

LISTING 2
SASIC program to generate machine code block and udg's.

```
  1 REM ************************
        Machine code and UDGs
        ************************
 10 CLEAR 59999  LET s=0
 20 FOR i=60000 TO 60114
 30 READ x  LET s=s+x  POKE i,x
 40 NEXT i
 50 FOR i=65280 TO 65368
 60 READ x  LET s=s+x  POKE i,x
 70 NEXT i
 80 FOR i=65368 TO 65465
 90 READ x  LET s=s+x  POKE i,x
100 NEXT i
110 IF s<>45248 THEN PRINT AT 1
0,12;"ERROR!!!"  STOP
120 PRINT AT 10,7;"SAVING MACHI
NE CODE"
130 SAVE "PRINT"CODE 60000,370
140 CLS   PRINT AT 10,11;"SAVIN
G UDGS"
150 SAVE "UDGS"CODE 65368,88
200 DATA 60,2,205,1,22,205,107,
13,62,2
201 DATA 205,1,22,42,75,92,17,0
,0,25
202 DATA 205,17,192,2,26,238,22
8,0,38,62
203 DATA 16,215,180,50,211,234,
205,164,238,216
204 DATA 59,211,254,215,58,16,2
05,123,189,194
205 DATA 123,234,122,184,194,12
3,234,201,254,164
206 DATA 202,186,234,254,146,20
2,206,234,254,146
207 DATA 202,206,234,254,147,20
2,205,234,254,148
208 DATA 202,195,234,254,149,20
2,202,234,254,150
209 DATA 202,205,234,254,151,20
2,206,234,175,201
210 DATA 62,1,201,62,2,201,62,3
,201,62
211 DATA 4,201,62,5,201
300 DATA 44,75,92,126,254,98,98
,2,66,238,206
301 DATA 164,25,238,196,42,236,
35,126,92,203
302 DATA 236,35,35,34,205,235,2
60,187,236,254
303 DATA 1,202,181,236,205,140,
235,205,181,236
304 DATA 48,205,235,237,91,204,
236,26,6,25
305 DATA 34,205,235,60,204,236,
71,60,203,236
306 DATA 144,88,203,236,42,205,
236,126,254,38
307 DATA 194,66,236,38,34,205,8
35,60,203,236
308 DATA 61,60,203,236,195,166,
236,60,203,236
309 DATA 254,33,218,137,236,175
,201,60,203,236
310 DATA 36,254,236,93,1,201,48
,205,235,17
311 DATA 31,0,25,126,254,31,218
,168,236,19
312 DATA 183,60,254,235,201,36,
120,254,32,194
313 DATA 175,236,195,159,235,37
,40,43,126,165
314 DATA 236,83,2,205,1,22,237,
91,205,236
315 DATA 237,75,204,236,6,0,205
,60,92,60
316 DATA 13,219,201,24,24,119,1
76
400 DATA 16,24,60,60,110,114,24
,0,105,0,0
401 DATA 0,56,126,242,66,0,0,16
2,153,0
402 DATA 0,182,153,0,0,40,100,0
,110,124
403 DATA 30,0,0,0,24,60,126,52,
60,0
404 DATA 0,219,255,60,126,102,0
,31,0,0,0
405 DATA 0,40,3,0,60,0,0,10,30,
60
406 DATA 60,124,16,0,22,28,60,1
20,254,12
407 DATA 255,128,0,0,0,0,0,0,0,
0
408 DATA 0,252,124,4,4,65,80,28
,0
```

prints continuously downwards from the current PRINT position, whereas the previous routine produced a scrolling display. It's convenient to have both the map and text printing routines stored on tape as a single code block (saved as **"PRINT" CODE 60000,379**) — which is why I've given them together now even though we won't be using the text printing routine until next month. The call addresses, by the way, are USR 60000 and USR 60200 respectively.

UDGs

The last chunk of data in Listing 2 defines the UDGs required for the game.

The program will save these as separate code block **("UDGS" CODE 65368,88)**. You should note that the map printing routine will print the correct colours for the graphics characters only as I've defined them in figure 1.

Figure 1 Codes for the map's graphic characters.

CHR$ CODE	SHAPE	COLOUR
144	Mountain	Blue
145	Downs	Green
146	Water	Cyan
147	Woodland	Green
148	Village	Red
149	Keep	Magenta
150	Meadows	Green
151	Pine forest	Green
152	Ship	Black
153	(Plain)	—
154	Army	Black

There's no reason at all why you shouldn't change the shapes themselves using your favourite UDG designer if you wish. But you mustn't, at this stage, change their *meaning*, or their order if you're to avoid getting into a terrible mess later on! CHR$ 144 (or GRAPHICS SHIFT/A, if you prefer) *must* be a mountain, and so on.

Now for the moment of truth. Somehow, we need to get the data for 704 locations into our map array — and if I were to present you with a list of 704 numbers to type in, you wouldn't be very pleased, would you? Can't say I'd blame you! Let's make ourselves a map editing program instead. Type in Listing 3, save it to tape with **SAVE "MAP EDITOR" LINE 1**, and then stop the tape in that position and put it to one side. Enter **CLEAR 59999** as a direct command, and load in the two code blocks you saved from Listing 2 thus **LOAD "PRINT" CODE: LOAD "UDGS" CODE**. Now replace the editor tape and **SAVE "PRINT" CODE 60000,370: SAVE "UDGS" CODE 65368,88**. (They must be saved in this order). Rewind the tape, type **LOAD ""**, and wait for the menu to appear.

At the top of the screen you'll see the various UDG shapes presented for ease of reference — except that the "Army" graphic will be missing since this doesn't form a permanent part of the map. Ignore options 1 and 2 for the present, and select option 3 'Edit map'. You'll be greeted by a blank screen containing a white cursor square, with brief instructions displayed on the bottom two lines. Try moving the cursor

LISTING 3
The map editor SSSIC program

```
  1 REM ************************
        MAP EDITOR
        ************************

  9 DEF FN i(x)=(x=144)+10 AND
x<148)+13 AND x>146)+14 AND (x>3
48 OR x=147 OR x=150 OR x=151)+9
(9 AND x=146)
 10 BORDER 6  CLEAR 59999  LOAD
"PRINT"CODE  LOAD "UDGS"CODE
 DIM x$(22,32)
 20 CLS   PRINT AT 18,11; PAPER
6;"Loading map";AT 17,10;"3
 Edit map"
 30 PRINT AT 1,14;"UDGS";AT 3,8
;"A B C D E F G H I";AT 4,8; FO
R x=144 TO 152  PRINT INK FN i(
x);CHR$ x;" ";  NEXT x
 40 PRINT #1; BRIGHT 1;AT 0,0;"
SELECT OPTION"  PAUSE 0  LET i$=
INKEY$  IF INKEY$="I" OR INKEY$;
"S" THEN GO TO 30
 50 IF i$="I" THEN CLEAR  LOAD
"MAP" DATA x$()  PRINT AT 18,4;
"Loading completed."  PAUSE 50
 GO TO 20
 60 IF i$="S" THEN CLS  SAVE "
MAP" DATA x$()  PRINT AT 18,4;"S
aving completed."  PAUSE 50  GO
TO 20
 80 LET x=15  LET y=10  ADDRESS=
26 USR 60000  GO SUB 1000
 90 INK 0  PAPER 5  PRINT BRIGH
T 1;AT y,x; OVER 1;" "  PAUSE 0
 LET i$=INKEY$
 95 IF i$="X" THEN GO TO 30
 100 IF i$<>CHR$ 13 THEN GO TO 80
0
 110 IF i$<>CHR$ 10 THEN PRINT AT
y,x;" "  LET x$(y,x)=" "  G
O TO 80
 120 PRINT BRIGHT 0;AT y,x; OVER
1;" "  LET x=x-(i$="L" AND x>0)
+(i$="R" AND x<31)  LET y=y-(i$=
"U" AND y>0)+(i$="D" AND y<21)
GO TO 80
 200 GO SUB 1010  PRINT BRIGHT 1
;AT y,x; OVER 1;" "
 210 PRINT AT y,x; FLASH 1; OVER
1;" "  PAUSE 0  LET i$=INKEY$
IF i$="m" OR i$="M" THEN GO TO 2
10
 220 LET i$=CHR$ 147+CODE i$[ P
RINT AT y,x; INK FN i(CODE i$);
FLASH 1;i$  LET x$(y,x)=i$
GO SUB 1000  GO TO 80
1000 PRINT #1; BRIGHT 1;AT 9,0;
PAPER 3;"5,6,7,8: Move cursor"
 PAPER 2;"9: Quit  ";"C3/8= Do
ints" ;"PAPER 5;" ENTER= Add gra
phic"  RETURN
1010 PRINT #1; BRIGHT 1;AT 9,0;
"Press the appropriate letter for
the graphic you wish to add here
"  RETURN
```

variables are assigned, or the variables area must first be CLEARed before loading the array from tape into a BASIC program.

Listing 2 will POKE in the necessary bytes for the map printing routine from BASIC — but it also contains two other important code blocks. The first of these "extras" is a machine code routine for printing text held in the BASIC variable z$, in such a way that words are not broken at the ends of lines. I haven't given the assembly language program for this, since it's very similar to a routine I gave in the May 1986 issue of ZXC. The only important difference is that this routine

FIGURE 2
The on-screen map of the 12 shires.

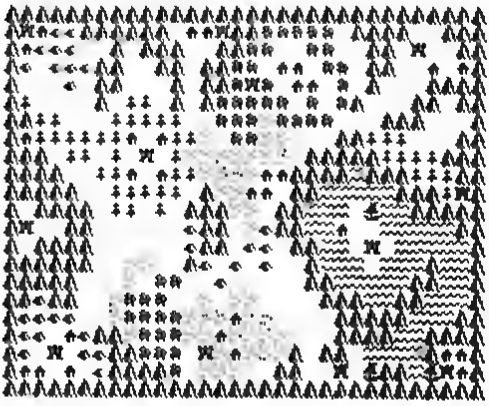


FIGURE 3
Guide to key presses for map editor.

```
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AFEBBAAAAAA EEFAADDDDD AAAA   AAA
AEBBB  A AAA  AADD  DD  AA F  AA
AB BBBAA  AA AADD EE DD AA  E EA
A   B AA   A AADFD EE D A   AAAA
AA    A AA A ADDDDD D DA   AA AA
AAAA   AAAAA  DDDGDDDD   AAA   A
AEAAAAAAAE EAAG DDGG   AAAAA   AA
AAA AA A F AGGGGGGG AAAAAAAAAAAA
AAAA  AAE EAAGGGGEEAAAACAAAAAAAA
AAAAA  AAAAA AGGEE AACCCCCAAAAFA
A AAAA AA A AAAGG AACCC ICCAAAAA
AF  AA       BAA GBAACCE  CCCCCAA
A AAAA       BAA BB AACC F CCCCCA
AAAAAA  GG  AB B B  ACCC CCCACCA
AAAAA   G DD  B     AACCCCCAACCA
AABAA  GDDD  G GG    AAACCAACCCA
ABBBB  GDDDDGGGEGG    AAAAACCCAA
ABB EBAAGDDDGGEGGGG   AAAACCAAAA
AB F BBAADDD FGEGGGA AA CCCCAEEA
AEE E BAAAAD GGG  AA  F IAACIFEA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
```

square around using keys 5,6,7, and 8. OK?

Fine — now press ENTER, and the cursor will start flashing, ready for you to insert a graphic character. Press a letter key between "a" and "l" inclusive, and the corresponding graphic character will appear at the cursor position on the screen, in the correct colour. Finally, try passing CAPS SHIFT/O to delete it.

Going to war

Now that you're the proud possessor of a map editor you're in a position to build up the map for "War of the Shires". Figure 2 shows you what the map should look like at the end (except that yours will be coloured on screen), and Figure 3 shows you which keys you need to pressat each cursor position (the blank spaces, by the way, require no action on your part, just leave them blank). At any stage you can return to the main menu by pressing "q", subsequently saving the map array to tape using option 2. At the start of another session you can load in a partly completed map using option 1, and then carry on where you left off. Go on, admit it — this is a lot more fun than typing in 704 numbers, isn't it!

To a certain extent you don't need to keep rigidly to Figures 2 and 3 — you can shift forests, hills, meadows and villages around as much as you like, really. However, do please check the positions of the *keeps* very carefully (look for the letter "F" in Figure 3). The keeps *must* be in precisely the locations shown in the Figures, and there must be 12 of them. Mountains will limit the movement of armies in the final game, and so you should make sure that every location at the edges of the map contains a mountain. You'd also be well advised to avoid making changes to the region surrounding the keep of Darkness on the western edge of the map (say within seven or eight locations from the keep) for reasons which will be obvious later on. Also make sure that at least one ship is accessible from the mainland at the start, or your armies will be left high and dry! Within these limits, there's no reason why you shouldn't build up a small library of map arrays for use with the game.

Keep the machine code bytes, the UDGs, and your completed map array safely on tape — they're all vital. Till next month, when the action starts, happy map-making.

CROSSFIRE

The elusive 128 Keypad tracked down at last and a chance for you to nominate your choice in our quest to find The Greatest Unfinished Game of all time.

Keypad not required

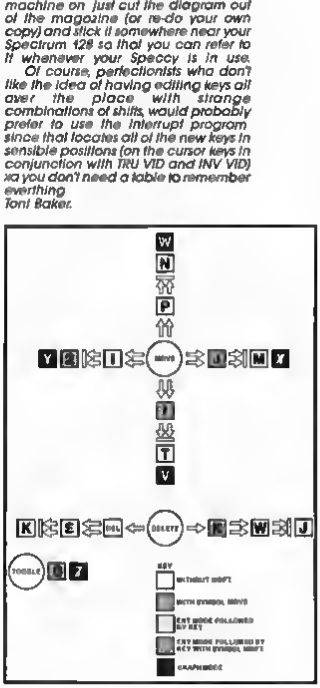
In the June issue of ZX Computing there was a program I wrote for a machine code interrupt routine which put all of the new keys from the not yet available plug in keypad for the Spectrum 128 in sensible positions on the Spectrum 128 keyboard

An interrupt routine, however, is not necessary at all! All of the keypad keys are already on the Standard Spectrum 128 keyboard, although in rather peculiar positions. The diagram accompanying this letter shows exactly where these new keys are. All of the symbols from the keypad are visible in the diagram, and by each symbol is a coloured square containing a letter or number (or in one case DELETE). The colours tell you which combination of shift key and extend mode is required with the letter or number in question. For instance, the symbol (which means CURSOR DOWN TO END OF PROGRAM) is accompanied by the letter T in a green square, and the letter V in a black square. A glance at the key will tell you that a green square means EXTEND MODE FOLLOWED BY, therefore, pressing EXTEND MODE followed by T will move the cursor down to the end of the program. Similarly, since a black square means GRAPHIC MODE, it follows that pressing GRAPH followed by V (followed by GRAPH again to exit graphic mode) will have the same effect.

If you wish to make use of the new editing keys, but can't be bothered to load in and set up an interrupt routine program each time you switch the machine on, just cut the diagram out of the magazine (or re-do your own copy) and stick it somewhere near your Spectrum 128 so that you can refer to it whenever your Speccy is in use.

Of course, perfectionists who don't like the idea of having editing keys all over the place with strange combinations of shifts, would probably prefer to use the interrupt program since that locates all of the new keys in sensible positions (on the cursor keys in conjunction with TRU VID and INV VID) so you don't need a table to remember everything.

Toni Baker.



Start to finish

When it comes to games software is it a case of many are played but few are finished? In the world of books there are "unread classics" tomes that sit proudly on the owners shelves but are never looked at. Are there games which have totally bamboozled you and been left halfway through or adventures that have left you totally stumped and languish somewhere at the back of a cupboard?

Here at ZX we are announcing an amnesty on games and adventure playing and readers are invited to point the finger at those games which have frustrated them most. Fill in the coupon below and from your responses we will be able to identify the most unfinished game and adventure of all time. Any additional comments on games playing are welcome and will form the basis of an article in a future ZX. Please send your nominations by December 5th 1986. Senders of the first 10 coupons drawn out of the hat will win a prize.

Great Unfinished Game Quest

My nominations for the Great Unfinished Game are

1 .....

2 .....

My nominations for the Great Unfinished Adventure are

1 .....

2 .....

What proportion of games and adventures that you buy do you play right the way through to the bitter end?

.....

Name .....

Address .....

.....

.....

.....

Send to Great Unfinished Game Quest, ZX Computing Monthly, 1 Golden Square, London W1R 3AS

CROSSWIRES

Ray Elder tackles more readers' technical problems.

This month we really have a variety of obscure enquiries and due to their unusual nature, such as the operating commands of an ancient disk drive interface or the special commands of the American TS computer, we hope that perhaps YOU can help our desperate readers

Dear Sir

Q *I have the following question to ask, I recently bought a Viscount disk drive interface for my Spectrum at a sale in a local computer shop.*

But they didn't have a manual to go with it and they didn't know how or if it worked. I bought it anyway as it cost me only 10 guilders (about 2 pounds) but now I am trying to find out what commands to use with it

It seems to work all right. It didn't wreck my Spectrum when I connected it and gave me a message on powering up. The message was "(c) 1983 by Marconics Ltd"

A friend of mine tried to find out what commands to use by reading the contents of the eprom of the interface but couldn't work it out

So I hope you can supply me with the commands or an address of Marconics Ltd

PS I enjoy your magazine very much
Yours faithfully
Daniel Muller Haarlem, The Netherlands.

A I am afraid that the Viscount was just about the least popular of all the Spectrum Disk units, but at two quid you've got a bargain!

We have no address for Marconics they seem to have disappeared but if any of our readers owned such a beast and would send us the operating details we would be only too pleased to forward them to you

Dear Sir

Q *Last month I read an article about a brilliant program sold in America similar to the CARD DESIGNER for the Commodore 64 called "Greeting card designer" for the TS2068 BY ZEBRA systems, Woodhaven New York which I sent for and back came the program with a catalogue full of goodies or so I thought*

I was told the Timex 2068 computer was the same as the SPECTRUM 48K, however after the program loads I come up against two problems. The first is there are some different characters in the listing that my Spectrum doesn't understand (enclosed is an extract of the listing). The second problem is that the program doesn't allow for the use of my interface, only AERCO TASMAN B, TASMAN-C and AB.J. Is there any way I can convert the program to work with my set up. I have a SPECTRUM 48K+, "ZX LPRINT III" interface and a "EPSON LX-80" printer

Your assistance in making this program work for me would be more than appreciated.
Yours sincerely
R.A. Williams, BFPO29

A I am afraid that there are several differences which make the USA computer and the Spectrum incompatible. Timex were rather unhelpful in supplying a TS machine for us to work with and so we really know very little about it

BUT we have many readers in the USA and perhaps one may help us. The Characters which cause the confusion are a curly bracket and a copyright sign which occur after a full colon

You could try simply deleting them and hope that they are something unimportant such as sound commands, if you rerun your computer then you'll soon find out!

I would suggest that you try this and perhaps add a line 2185 LPRINT CHR$(0) CHR$(4) CHR$(13)

This is the interface initialisation commands and in that line it should set it up ready for the programs use. A straightforward COPY command replacing one of the print routines could solve the problem.

Without my having the software to try out I'm afraid that you'll just have to experiment

Dear Sir

Q *I wonder whether you can help me. I have a ZX Spectrum+ and an Alpha com 32 printer. All very satisfactory until recently I purchased, after reading an article in ZX Computing by John Wase, a Discovery 1 disk drive.*

I immediately started having problems and found that these only occurred when the printer was plugged in. I was unable to load commercial tapes even from tape and could not convert Tasword II as advised at the end of the Tasword manual. The command LOAD " CODE would just at be accepted. Without the printer all worked as it should

I wrote to Opus before I discovered about the printer and they just advised me to buy multiface 1. I have written again since but so far they have not been able to help.

I have also telephoned Dean electronics to ask if they knew of any reason of the apparent incompatibility. They have supplied me with a diagram of the pin connections to the plug but this is not a lot of help.

Thanking you in anticipation,
Yours faithfully,
R.J. Lawman, Cardiff.

A This has been a problem which arose after Alphacom had been supplying their printer for some time. It is simply not compatible with some peripherals and unfortunately the Discovery is one of them!

The only real advice I can give you is to buy a Centronics type full spec printer such as the GLP 2 or the Shinwa CP80

I know it will set you back around £100-£200 but if you intend using your computer for serious text output them you will never regret it

Dear Sir

Q *I own a ZX Spectrum 128K. When using it (programming or game playing) I get flickers of interference across my television screen*

The flickers last only an instant and come every seven seconds. They appear as silvery lines and in no continual place. As they are very distracting could you please tell me if this is normal and if not is it my computer or my television that is at fault
Yours Sincerely
Richard Finch Southampton

A Probably neither

This sounds like a case of interference from some other piece of electrical equipment. It could be that the computer is too close to your TV or that the PSU and the computer or the TV are interfering with each other

Try moving each unit to different positions, but in the end I strongly suspect that another TV or a Cooker, Video, Fridge etc, is causing the problem. The only sure way is to turn everything off and just have your computer and TV on. Then again, a neighbour's unit might be the source of the problem

Often one of the special suppressing plugs will cure or help alleviate the problem. It's a case of trial and error yet again!

A very helpful letter was received on the topic of the Opus and Printers from Mr Turner of Hull, it reads

Dear Sir

A *Reference Janet Watson's query in August edition of ZX Computing. I too have the Opus Discovery and Brother M1009 printer and also experienced problems using Tasword 2. After hours of work I finally contacted Tasman Software Ltd. They were most helpful*

The answer is Discovery will accept the microdrive version provided the following alterations are made to the basic program

ADD LINES
6 CLOSE # 3
8 OPEN # 3"B"
DELETE LINES 279 AND 281

This is because the Discovery will not accept FORMAT "b"X Where X is the baud rate.

Printing may be stopped as normal by pressing and holding 'q' but if BREAK is used then you must restart by executing GO TO 6 or you will lose the text. You will also have to start to print from the beginning again
Yours Faithfully,
TW Turner


ACE
'FLIGHT SIMULATOR OF THE YEAR'
OUT NOW —
SPECTRUM VERSION £9.95
& PLUS/4 DISK VERSION £12.95
FREE POSTER WITH EVERY COPY
"AT LAST YOU CAN REALLY FLY!"
RAF PILOT
"I JUST COULDN'T BELIEVE HOW MUCH THERE WAS IN IT"
"ACE IS ONE OF THE BEST SIMULATORS I HAVE EVER PLAYED"
"THERE ARE FLIGHT SIMULATORS AND THERE ARE FLIGHT SIMULATORS — AND THEN THERE'S ACE"
COMPUTER AND VIDEO GAMES
CASCADE GAMES
CASSETTE £9.95
DISK £12.95

The MUSIC Machine

Ray Elder enthuses about the potential of Ram's new comprehensive musical add-on.

The Music Machine
Ram Electronics
£49.95

This smallish uninteresting looking black plastic box is perhaps the most powerful, versatile and exciting peripheral that I have had the pleasure to review for ages!

Described as 'The Complete Home Computer Music System' I consider this claim to be a modest appraisal of the unit, it could be used in professional applications as well. So what does it do?

At Home

The great majority of purchasers will go for its superb sampled drum sounds and built in sequencer allowing complex and carefully constructed patterns to be created bar by bar and linked together to form a complete song.

A very versatile unit the quality and flexibility of which is equal to the £250+ Yamaha dedicated RX21 that I use. On the plus side is the fact that each bar can be set to individual tempos, not feasible with the RX. But there is a real time play mode where your fingers can attempt to mimic Buddy Rich. On the minus side is there is no "real time" pattern constructing and only two Toms, the RX has three. However the Music Machine has Cowbell and the RX hasn't.

But this does not matter!

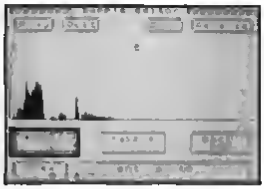
If you want another Tom then you can have it, or remove the cowbell or any of the sounds and replace them with any other you fancy because the Music Machine is also a Sampler! This means that you can record digitally any sound you like via the cheap microphone supplied, tape or line out of an amplifier.

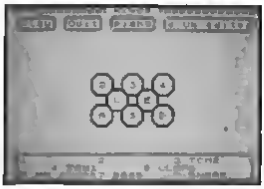
Once a sound is in memory then you can set the start and end parameters and play as much or as little of it as you wish, even looping it for continuous sustain. You can reverse it and play it backwards, interesting, or go to the 'piano' screen and play it back over a 12 note, one octave range rising from middle C.

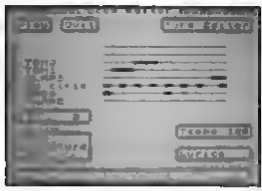
Once you have exhausted the novelty of that then you can use the tune sequencer and play it over a much extended three octave range and in two parts. It is here that some of the limitations of an inexpensive unit may become audible, the sustain effect is played by a very fast staccato repeat and it can be heard as such, also the tone may become unpleasant in the extremes of the range. A £10,000+ Fairlight allows multi samples across the whole range to be taken so what can you ask of a unit such as this?

For technicrats the sampling rate is 19 444KHz and this gives approx 1.1 secs, it sounds short, but in fact it gives plenty of time to say "Samantha Fox" (should you so wish). A start and end of a sustain loop within the sample feature would have been useful, and the enlarged display of the waveform often resembles a burst from an airbrush and this is a pity.

The rear of the unit bristles with sockets and the three which most owners will use are the microphone IN, the Phono OUT to an amplifier or stereo and a







Headphone for personal listening. Only the output from either the tune sequencer or the drum sequencer can be sent to the headphone or phono socket at any one time.

Not just simply a fascinating toy as are most of the samplers I have seen, including some made by well respected companies in this field, but actually usable to create genuine musical compositions.

For anyone with musical interests this is an absolutley essential piece of equipment. I've heard 'Rap' records with less backing than this can produce, and the quality is good enough for studio use.

Midi

Should you be one of the growing number of serious home musicians who own a keyboard such as the Casio CZ101 or any of the other instruments fitted with MIDI (Musical Instrument Digital Interface) then you can greatly extend both units' use.

There are three MIDI sockets fitted, standard five pin DIN, for MIDI IN, OUT and THROUGH and via these you can either play your sampled sounds over the full keyboard range, sync with external sequencers, play the Music Machines sequencer out to the keyboard (at the same time as using the drums via the headphone or phono out) or any other combination you desire. This is possible from the software which operates in both the common Omni and Poly modes allowing full channel assignment and internal or external clock control.

Easy use

All this in one unit and program must make it complicated to run.

Not a bit! The manual is written to suit all abilities, step by step chatty approach throughout but with full technical detail for those with deeper understanding — something many of the dedicated "professional" units I've looked at do not usually give.

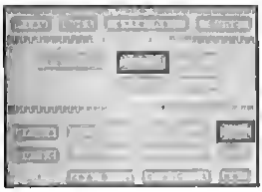
As for operating the menu system has been carefuly designed with many options being consistent whether you are in the Sampler, Piano, Midi, Echo or any of the many other operating screens. You soon learn the essential commands and the others are nearly all self evident.

I am afraid this review is rather on the enthusiastic side, but then I have deliberately compared this unit with others of much higher price and it holds its own. A simple MIDI interface by itself can cost over £100, this has much, much more to offer.

RAM ask for ideas, there is no limit when you consider MIDI, for example how about, A real time multitrack sequencer with auto correct and variable quantize or a multitrack step time sequencer, both with high resolution printout facilities, or a midi patchbay system (give me a unit and I'll write one of those!) or or the list is vast indeed.

Yes, you may say but it'll cost the earth and be well out of my reach. I agree it is a little more than the average £15-£30 interface but at an astounding £49·95 it offers incredible value for money, the chance for anyone with an interest in music to get into the latest hi-tec musical development and I have no hesitation in giving it the highest accolade possible from a hard bitten, cynical reviewer.

I will buy one.



Joysticks

Joystick connoisseur Charlton Appleby takes a critical look at established Spectrum joysticks and also playtests Cheetah's new 128+2 compatible sticks.

125+ Cheetah £8.95

The Cheetah 125+ joystick is a pistol-grip type of device with a thumb button on the top of the stick and a trigger for your fore-finger There is also the addition of two buttons on the ample, rounded, base The moulding of the stick is very curvacious and fits the hand nicely, the base has four suction cups on it to secure the stick firmly to a smooth surface

The cable is about a yard long with two plugs on the end This split adaptor also features on the Mach 1+ and is of special interest to Sinclair owners, especially prospective purchasers of the ZX Spectrum 128+2 One of the plugs is a normal Atari-type D9 suitable for the majority of home computers, and the other one is a grey connector for the side of the new Sinclair machine. This second connector is re-wired in the manner that the new machine needs to get its signals, so you don't have to buy those awful SJSI things. My only worry is that, whilst this is a good idea, the way that the first connector has two wires coming out of it may weaken the link at the plug attachment point As this is an area where a lot of joysticks break, and short of cutting the cable and replacing the plug, it is irreparable.

Also on the stick is the now almost obligatory, auto-fire switch This is a switch to make the joystick function like a machine-gun, and to save wear and tear on the fire buttons (an area where a joystick is likely to fail first) A lot of modern games have auto fire detectors that will cut out this facility or make it function to the detriment of the player, but a lot of games will be made more playable — In fact, some games are almost impossible to contend with without an auto-fire feature.

My main gripe with this stick is that it is not very responsive, the internal construction is that of collapsible domes, which usually give the best feedback, however in this case the stick is almost dead in my hand and games can be very tricky to play

However, I would definitely recommend the 125+ for owners of the Spectrum 128+ It has all the features you would expect from an up to date joystick and although a bit lacking in the response department it's an efficient multi-purpose stick and at £8 95 it's a bargain

Mach 1+

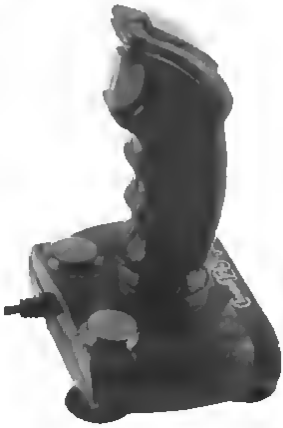
Mach 1+ Cheetah £14.95

The Cheetah Mach 1+ is similar to the 125+ in that it has four fire buttons two on the base and two on the stick and in the same positions. However in this case the body of the stick is much bigger and angular and thus more difficult to use and a lot less comfortable than is expected for this kind of money

Otherwise the features of the other model are retained — two plugs, auto fire, suction cups, etc. The internal construction of this stick however, is with micro-switches. These will last virtually forever under normal conditions.

The stick is awkward to hold and so is the base Micro-switches are not very responsive at the best of times, and that point is proved again with the Mach 1+

Apart from being very reliable it has little to recommend it over the 125+ If you want a joystick that will never let you down then you've found it with the Mach 1 but for enjoyable play opt for the 125+ The substantial price differential (£6) may also be a big influence on your choice



Ever since 1976 when the first Atari VCS reared its ugly head in a few pioneering homes, the joystick has been a major bone of contention. Within a couple of years, third party companies were producing alternatives to the Atari standard stick. When the computer took over the Atari D9 standard became the de facto method of connecting a joystick or tracker ball to a computer. This standard persists to his day with even the mighty machines like the Amiga and Atari ST having the same little socket on their sides.

All Spectrum joystick interfaces have this D9 connector in them, some even have two. The one notable exception is the new 'Amstradified' Spectrum 128+2, which has had the wires all jumbled up in an attempt to make you buy Amstrad/Sinclair Joysticks. For the purposes of this article I will assume that anybody with one of these machines has either got an adaptor, or forgotten that they exist at all and has gotten himself a Kempston interface or something similar.

So what do you shove into that hole in the side of your machine? Having been playing games with joysticks for the last eight years or so I can safely say that I have some favourites. You may not agree with me, but then joysticks are like golf clubs: different sticks perform a different job, so select one that matches your needs.

Atari Standard
Atari
£6.95

The original, and some say the best. This awkward looking and ungainly stick is notorious for having started the whole ball game off. Internally it uses collapsible dome technology to make the connection, deforming a dome of thin metal until the electrical switch is made.

This system has the advantage of high tactile feedback, but the disadvantage of poor reliability and a short life time. These sticks seem to need a 'bedding in' period before they work to their best efficiency. The greatest advantage is that they're cheap, however their shape is very angular and the corners can dig into your palm and hurt a lot after a marathon all-night session.

Atari Pro-line
Atari
£9.95

The successor to the previous stick, this controller uses a contoured grip with two fire buttons for left/right handed operation, or forefinger/thumb interchange. The short stick is steel and unlikely to wear out, and is incredibly responsive.

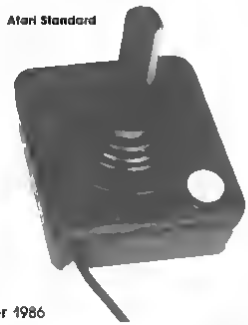
The contacts are still collapsible domes, but this seems to combine with the short shaft to make this one of the most responsive joysticks that I have ever come across. This is my all-time favourite general purpose stick: capable of playing any game that there is, was, or could be!

Atari Pro-Line

Quickshot II
Spectravideo
£11.95

Probably the best known stick in the business. The Quickshot II has a contoured grip that fits the hand in a manner so perfect that it is a miracle of design. Two fire buttons are provided, one in a pistol trigger position and one on the top that hits your thumb. The base has four suction cups on it to grip the stick to a flat, smooth surface for one handed operation. Also on the base is a little switch for 'autofire' operation. This switch connects to a small circuit inside the joystick that creates a machine-gun effect when using the fire button. This is achieved by pulsing the fire button's output to the computer. This allows multiple firing in a game that allows such things, though a few of the more modern games can detect when an auto fire switch is being used and will disable the fire button all together — with disastrous results.

Atari Standard



Internal construction is with collapsible domes, though with the large amount of leverage that such a stick affords, you may find that in some circumstances this stick will not have a long-life span — especially with younger players.

Fighter Pilot
Tandy
£6.95

This stick used to be marketed by Spectravideo under the name 'Quickshot' before the Quickshot II came out. Now re-badged Tandy are selling it under their own brand name.

This stick has a fire button on the base, one on the top of the stick for your thumb, and a contoured grip — though not up to the standard of the Quickshot II. The base has suction cups on it to provide a firm footing for one handed operation, though there is no great problem using two hands as the base is also designed to be held.

Internal construction is once again by the collapsible dome method, with the usual limitations of not being too hard wearing, but with the advantages of good control and tactile feedback.

Trackball
Atari
£22

Not really a joystick, but can be used as one. The trackball was first introduced into the coin-op arcades on a game called Missile Command, and more recently on a game called Marble Madness.

The track ball consists of a 'billiard ball' mounted in a casing with detectors to report its movement to the computer and a couple of fire buttons. Instead of bending a stick in the required direction ou roll the centre ball. This can give you an excellent control advantage in some games, but can be a liability in others. A track ball is at its best in Missile Command and Marble Madness type games, and can come into its

own in a lot of maze games.

A useful controller to have handy though definitely as a spare, rather than as your only control system.

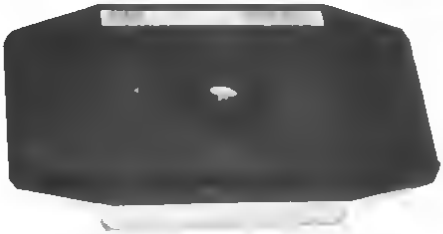
Speed King
Konyx
£12.99

This is a fairly new 'stick' with a less than conventional configuration. An 'ergonomically' styled grip fits into your left hand like it was part of it with the trigger resting neatly beneath the crook of your index finger. The top of the stick has a short, stiff stick protruding from it.

The switching is via micro-switches that will virually last forever. However, their response time is a bit slow and the tactile feedback is close to nothing. You hear your stick move before you can feel it or see it.

The grip is also a bit clicky at times. When you play for a long time in a difficult game, your hands can get a bit sweaty. With this stick you start to let it slip after a while and the whole situation gets out of control. If you are left handed — forget it!

Quickshot II



Trak-ball

Mazemaster
Tandy
£11.95

An interesting concept here, a joystick that can turn off its diagonal movement. Most joysticks allow for diagonal movement, but this stick lets you switch between eight-way and four-way operation. Why? For maze games of course. Ever had that time where you skid sideways into the spider? Well now this joystick will alleviate this to some degree.

The joystick is an awkward square shape, with a little stick protruding above it, this arrangement is fine for mazes, though I wouldn't want to play an action game with it.

Speed King

Construction is via micro-switch, and should last (effectively) forever, barring any adverse conditions.

Well, these are the sticks that I like to use. You may prefer others, but these have stuck with me through thick and thin and I wouldn't give them up for the world.

HARDWARE

sound sampler

Cheetah follow up the success of their Spectrum with a new Sound Sampler.

SOUND SAMPLER
Cheetah Marketing
£44.95

The Cheetah sampling system consists of an interface, software cassette and microphone. The interface connects to the port at the back of the Spectrum (48K Plus or 128) and has two control dials on the front, a mini jack sound input socket on the left hand side and a six foot lead fitted with a phono plug to take the output to an amplifier or stereo system. There is a

Sound sampling has become the "in" thing in the music field at the moment due to recent developments in technology and, since it is a computer based technique, it is not surprising that such a device should be developed for our home micros.

To put it rather simply, sound sampling involves making a digital recording of a voice, instrument, piece of music, or some other sound, processing it as required and replaying it in a choice of pitches.

problem in that the lead is not really long enough and the phono plug is only suitable for stereo or expensive mixing desks. The more usual plug is a standard jack, and it might have been better if the control knobs had been positioned on the top and a second socket had been fitted for output.

The microphone is a fairly basic one for use with a portable cassette recorder and is not really suitable for 'serious' use.

Although a Microdrive backup routine is supplied, there is a dire warning not to use the interface with anything other than another Cheetah Unit.

Tech specs

The specifications are impressive, replay over two octaves, superb processing allowing very fine selection of start and end points to be made and sustain start and end points. These are chosen on a graphic waveform display. Samples can be reversed or combined, saved or loaded and reconfigured at will.

The frequency or bandwidth is 17.5KHz and this is as good as you'll get on some dedicated samplers for many times the money. Sample rate is 70000 times a second and maximum length is around one second. Which is long enough to say your name or a simple Nineteen!

The utility or effects program is great for playing around with, providing echo, reverb, fuzz, chop, bubble, and pitch effects, very noisy though and there's not enough control for serious usage.

Usability

The publicity claims 'Home or Professional" use and I wouldn't disagree. All I would say is that the professional use may be rather limited, especially if it was intended for recording as the sound quality is good rather than excellent and the background noise is rather too high for professional standards even under optimum conditions.

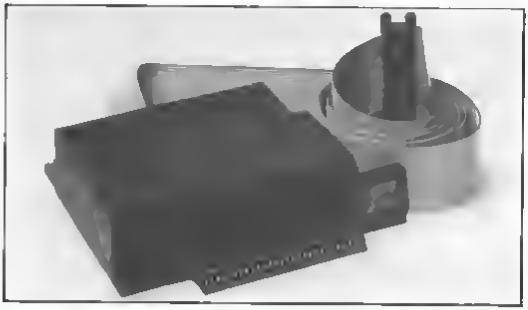
The input section is well designed, allowing a wide range of impedences from microphone, line or instrument sources and the output match proved compatible with both my power amp and my cassette line in.

Operating the sampler is a joy. Everything is menu driven and error trpiing seems to be very comprehensive, even with my idiot act in full swing it informed me of where and why I had gone wrong each time.

I loved it, even at the level of simply playing around it was great. I took it into a local school and the pupils had a great time with the utility program and the Science teacher was devising ways of using it for the new GCSE exams!

Finally I have spent quite some time using the sampler, and I am becoming more and more impressed with it. I would even cautiously suggest that a studio might be able to use it for some short and limited effects, provided enough noise reduction was available.

RAMPRINT



Not only does RAM's new interface have everything but the kitchen sink crammed into it, the instructions are easy to understand too!

Ramprint
RAM Electronics
£34.95

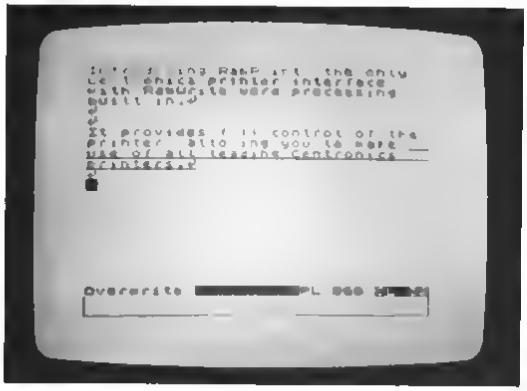
Now lets be sensible about this, what are the reasons for buying a 'real' printer to use with your Spectrum. The main ones have to be to get decent listings, screen dumps and wordprocessing facilities. I got hooked on wordprocessing about a year ago when I discovered Tasword 2, and I would much prefer wordpro to using a typewriter if it weren't for my complete inability to cope with printers. The words always look fine on the TV screen, but I can never get them to come out of the printer at the other end.

The trouble is that you can't just plug a full size printer into the Spectrum and get it to work straight away (you could do this with Sinclair's new ZX Printer but that was very limited in both quality and options it offered). First of all you need an interface and the lead to connect the two machines, then theres the awful business of initialising the interface and shoving in all the control codes. Then if you're using some sort of wordpro software, you'll probably have to fiddle with that to get it to work with the particular interface that you're using. And if you get any of that wrong the whole setup goes mad and starts vomiting up reams of paper covered in a long-dead Greek dialect when all you wanted was your laundry list.

The whole business is a pain, and it's driven me back to my steam-driven typewriter many a time.

With that in mind it's strange that nobody has yet come up with the idea of producing an all-in-one printer interface with its own wordprocessing software so that the two are compatible and don't require hours of fiddling to get them working together. But that, at last, is what RAM Electronics have done with their new Centronics type RAM Print interface and RAM Write software which is stored on a ROM chip within the interface itself, not to mention some of the other features included.

The RAMWrite 32 column wordprocessor



Kitchen sink syndrome

To start off with, the interface comes with its own Centronics cable built in, so there's no additional expense involved in buying one or working out what to do with it.

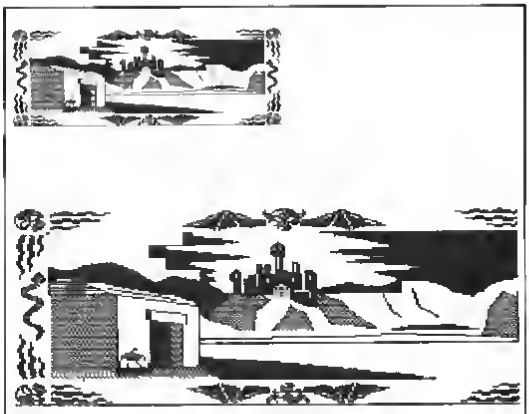
Then, surprisingly, RAM have made the interface emulate the old ZX Printer so that you can use the Spectrums own LLIST, LPRINT, and COPY commands for listings and screen dumps. this is very sensible as it combines the simplicity of use of the ZX Printer with the high quality printing available from the whole range of Centronics printers.

RAM have also avoided a potential problem here as the Spectrum 128 isn't compatible with the ZX Printer when operating in 128 mode. However if you enter the command PRINT IN 251 on power-up then you can sidestep that particular problem. the commands for the 128 are slightly different, LPRINT '+ copy' rather than simply COPY, but that's not too much of a problem.

Now we come to what is normally the tricky bit, the control codes. Thankfully though, RAM have given you some help here also. Entering the command LPRINT "(c) set" calls up an options menu, a pull-down window which overlays, but doesn't wipe out, what is already on the screen. The options available here aren't exhaustive but they do at least

cover the most often used options Line Feed, Tokens, Copy Text Enlarge and Width For each of these you can simply choose the On or Off state as required without any of the business of having to look up control codes and enter them as endless strings of CHR$ The RAM Write software has its own set of control codes for different types of printing, but if you want to do fancy things with listings then you'll probably have to go back to looking up the codes in your printer manual Cest la vie.

As a final touch the interface also includes a Kempston joystick interface — RAM are certainly making sure they've covered all their bases. The interface is well constructed in a robust black plastic. There are no exposed parts and theres even a small ring that goes around the power socket to make sure that everything fits nice and tidily



The Enlarge option allows you to copy two sizes of screen dumps.

RAM Writes

Of course the most obvious attraction of this interface (for me anyway) is the inclusion of a wordprocessor program on ROM and the convenience of instant access and printer/interface compatibility Entering the command LPRINT '©' word' instantly calls up the RAM Write program and you are presented with a screen in which the upper 22 lines are blank (for text entry) while the lower two lines are for the status display and choice of option When the cursor is on the bottom line you can choose whatever options you want simply by typing the appropriate letter (b= Back to Basic, c= Copy text, d= Display text and so on) The options available cover all the usual string search/replace, block copy/delete and so on These aren't as exhaustive as the options available in Tasword or The Writer, but they're adequate for most simple wordpro, apart from the omission of a wordcount (one day someone will produce a wordpro that has its own word count)

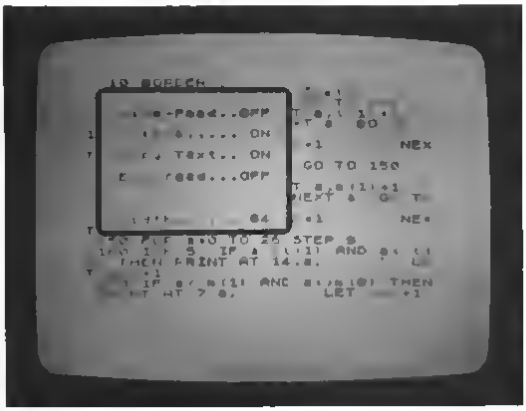
Entering 'e' puts you into Edit mode and reveals the only real disappointment in RAM Write. You can only enter text in the Spectrum's normal 32 characters per line, and while the printed output does have wordwrap 64 character lines justification on and off you can't see these things on screen while you're editing the text There is a display mode which allows you to see the text in 64 character lines, just as it will be when printed onto paper but you can't edit the text in this display if you want to make any changes to the layout of your text you'll you'll have to go back into edit mode and 32 character display

This is a bit of a bore in practice I found that I could just go ahead and slap the text onto the screen and it would come out of the printer looking okay, but I still wanted to get a look at the text as it would appear on paper and this meant a lot of switching to and from Display mode If you're used to the 64 column display of Tasword or The Writer this can seem a bit of a step backwards and a lot depends on whether you find the convenience of the interface/software combination an adequate compensation for the relatively unsophisticated editing facilities.

On the other hand you could easily use Tasword with RAM Print, and this will give you the best of both worlds.

Despite the shortcomings of RAM Write the convenience of having so much crammed into the interface and the ease of use that RAM Print offers make the whole thing a godsend for someone like myself who is totally baffled by the intricacies of printers and control codes and the like At last I've gotten my hands on a word processing set-up that you can just plug in and use straight away Don't forget that a decent Centronics interface would cost about £30 anyway and for just £35 RAM Print offers a Centronics interface, plus cable joystick interface, a passable wordprocessor and user friendliness that it's difficult to put a price on In other words I liked it a lot RAM Print is the most useful bit of hardware to come my way for ages.

RAMPrint's pull down options menu



RANDOM MEMORY

You may remember a few issues ago I suggested using a series of short subroutines, called in succession to produce an illustration. Now's the time to follow up that idea.

As 3 D pictures seem to be in vogue at the moment let's set about producing the graphics for a dungeon/passage type adventure. We will need views into rooms, along passages, around corners, into dead ends, through junctions etc. Although this may seem a little daunting it is in principle quite simple as all of these views can be made up of just a few, often repeated lines. Type in **Program 1**, keeping to the line numbers, and I'll show you what I mean. Now call a few lines with the command GOSUB (line number). In each case a few lines will appear on screen. Not very impressive you might think, but don't give up yet. These are only the picture elements. Add **Program 2** to the listing for Program 1 you have on board. Now set PAPER to 0 and INK to 7 — it'll look more 'dungeony' in white on black background — then GOSUB to each of the new lines in turn, with a CLS between each call and you'll see how various combinations of those original picture elements can be joined to give a series of rooms, junctions, passages, turns etc.

So far so good, but our adventurer would be rather restricted in his movements. Let's add some doors, arches, openings, holes, ledges, and a crevasse! While we're at it we might as well supply some flaming torches to through a glimmer of light on the proceedings. Add **Program 3** noting that the capital letters are all udgs, and must be entered in the G mode. We'll also need to set these udgs so input the data from **Table A**, using

FOR f=USR "a" TO USR "p" + 7 : INPUT i : POKE f, i : NEXT f

Now you can add a lot more features to your basic rooms and passages. Try

9999 LET i=2 : LET c=19 : GOSUB 36 : GOSUB 37 : GOSUB 3 : GOSUB 22 : GOSUB 26 : GOSUB 27 : GOSUB 28 : GOSUB 39 : GOSUB 41 : GOSUB 42 : GOSUB 44

You should get a view similar to that shown in **Fig. 1**. Note that the value of c determines the position of opening, arch or hole on the facing wall produced in lines 29-37. Also the value of i in lines 41-44 determines the INK colour of the handle of the torches. (The shimmering effect in the torches is caused by nothing more than the Spectrum's infamous 'dot creep'. There just had to be a use for it!) I'll leave you to experiment further — the function of each line is REMed in the listing — and to discover impossible combinations. (Like trying to include a crevasse in a room!)

Instant Graphics

It may be that the perfectionists amongst ZXC readers are not happy with the way the picture is drawn before their very eyes. It may be that you would prefer the illustration to suddenly appear, complete, on screen. All that is needed for this effect is a combination of trickery and a short machine code routine. Use the following line to input these numbers: **33, 9, 88, 1, 192, 2, 22,**

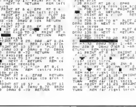
PROGRAM 1

```
 16>PLOT 16,175  DRAU 48,-44  F
LOT 0,0  DRAU 64,32  RETURN
 11 PLOT 239,175  DRAU -48,-48
 PLOT 255 0  DRAU -64 32  RETURN

 12 PLOT 16,175  DRAU 16,-16  D
RAU 0 -143  DRAU -31 -16  RETURN

 13 PLOT 240 175  DRAU -16,-16
 DRAU 0 -143  DRAU 31 -16  RETUR
N

 14 PLOT 32,127  DRAU 191 0  PL
OT 32,32  DRAU 191 0  RETURN
 15 PLOT 223,127  DRAU -159 0
DRAU 0 -95  DRAU 159 0  RETURN
 16 PLOT 32 127  DRAU 159 0  DR
AU 0 -95  DRAU -159 0  RETURN

 17 PLOT 223,127  DRAU -32,0  U
RAU 0,-95  DRAU 32,0  RETURN
 18 PLOT 32,127  DRAU 32 0  DRA
U 0 -95  DRAU  32 0  RETURN
 19 PLOT 88 128  DRAU 48 -48  R
LOT 192 128  DRAU -48 -48  PLOT
84 32  DRAU 48 23  PLOT 181 32
DRAU -48 23  FOR n=19 TO 88 STEP
 4  PLOT 89+n,98-n  PLOT 188-n,9
8-n  PLOT n+89 n/4+48  PLOT 188-
n n/4+48  NEXT n  RETURN
 20 PLOT 191,127  DRAU -127 0
DRAU 0 -95  DRAU 127 0  DRAU 0 0
S  RETURN
 21 PLOT 32 159  DRAU 191,0  PL
OT 32 18  DRAU 191 0  RETURN
```

PROGRAM 2

```
  1 GO SUB 12   GO SUB 13
9 21  RETURN   REM rear
  2 GO SUB 18   GO SUB 11   GO SU
B 19  RETURN   REM forward
  3 GO SUB 19   GO SUB 11   GO SU
B 88  RETURN   REM dead end
  4 GO SUB 19   GO SUB 19   GO SU
B 13  RETURN   REM right
  5 GO SUB 11   GO SUB 12   GO SU
B 18  RETURN   REM left
  6 GO SUB 12   GO SUB 13   GO SU

6 14  RETURN   REM right left
  7 GO SUB 18   GO SUB 13   GO SU
B 17  GO SUB 19   RETURN   REM fo
rward/right
  8 GO SUB 11   GO SUB 12   GO SU
B 18  GO SUB 19   RETURN   REM fo
rward/left
  9 GO SUB 12   GO SUB 13   GO SU
B 18  GO SUB 19   GO SUB 17   RETU
RN   REM forward/left/right
```

PROGRAM 3



A packed calumn this manth with Clyde Bish revealing the minimal memory raute to 3-D adventure graphics plus a useful 'Speedraw' routine.

7, 114, 35, 11, 120, 177, 32, 249, 201
FOR f=USR "I" TO USR "u" + 7 : INPUT I : POKE f, I . NEXT f
(If you want to use all the udgs you could move this code elsewhere) To call an illustration use a line such as **9999 CLS · INK 0 : GOSUB (each of the element subroutines) : RANDOMIZE USR "I" · INK 7**

This is how the trick works. INK is set to 0 — the same as PAPER — before calling the subroutines so they are drawn invisibly Calling the machine code causes all the attribute file bytes to be altered to 7, i.e. white INK on black PAPER, so the picture appears more or less instantaneously Finally INK is reset to 7 or you wouldnt see any subsequent printing! Note that the torch subroutines have to be called after the machine code or you'll get no colour If you want of use, say yellow INK on blue PAPER POKE the attribute you require — in this case 6 + 1x8=14 — into address (start 7) as well as making the obvious changes to the INK number.

If you want your adventurer to have something to look at in the second it takes to produce the picture you could print a message after the CLS. The graphics won't affect it as long as you avoid areas which will be drawn on. Generally rows 0 to 5, columns 8 to 23 are safe, or you could use the edit lines with PRINT 0 'message"

TABLE A

240	252	255	255	255	255	255	255
0	0	0	192	240	252	255	255
255	255	255	255	255	252	240	192
255	252	240	192	0	0	0	0
0	0	0	1	7	31	127	255
7	31	127	255	255	255	255	255
255	63	15	3	0	0	0	0
255	255	255	255	255	63	15	3
16	24	52	44	86	44	74	52
255	255	60	60	60	60	60	60
1	5	5	5	10	42	42	84
0	64	64	80	80	168	168	148
85	41	40	42	82	82	85	53
84	82	82	74	170	146	84	92
1	3	7	15	31	63	127	255
128	192	224	240	248	252	254	255

Using different combinations of doors, openings, arches etc. you can produce an enormous variety of illustrations. (There are 15 possible combinations of torches for a start even if you don't alter the value of i!)

I'll follow up this idea of picture elements further in a later article when we'll look at 'Lords of Midnight' type scenes but now to a completely different solution to the problem of big pics in few bytes.

Speedraw

If we had machine code routines to plot draw block in areas of paper and fill areas with ink we could build up a picture on screen very quickly from a string of data if this included information for choosing the right routine. Ladies and Gentlemen the Great Wizard of Exon proudly presents "Speedraw" a graphics utility to produce high resolution illustrations drawn at high speed and at an average cost of only 250 bytes per screen (Less if you reuse parts of one picture in another)

For the technically minded, this is how its done The secret is in the sequence of numbers the routine encounters. Lets call this the Drawcode. The value 255 (and to some extent 0) is reserved for use by the driver 0 on its own means return The number of 225s at the beginning of each sequence determines which mode is selected Exit from or jumping within a routine is controlled again by 255s being encountered Figure 2 gives a flow chart for each mode.

Use
CLEAR 64890 FOR f = 64891 TO 65367 : INPUT I . POKE f,I :

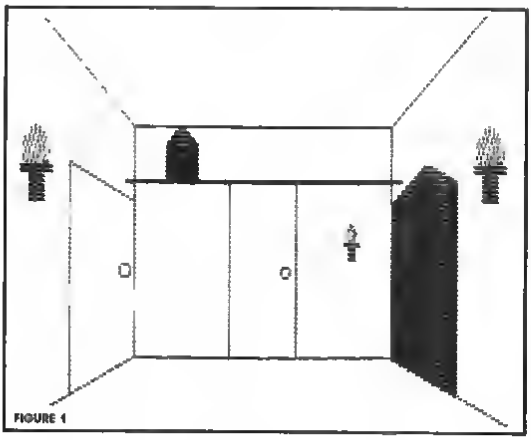


FIGURE 1

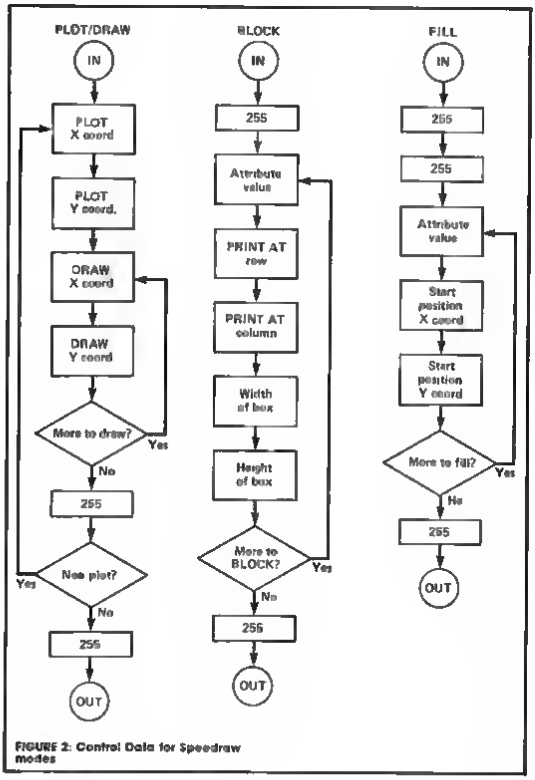


FIGURE 2: Control Data for Speedraw modes

PRINT f,I : NEXT f to enter the data for the machine code from **Table II**, and save with **SAVE "speedraw" CODE 64891, 477.**

Lets enter some example drawcodes to use each mode in turn

Plot/Draw

This produces the outline drawing Use the loader line **10 FOR f = 40000 TO 40021 INPUT I : POKE f,I : NEXT f (RUN)** to enter the following sequence of numbers, pressing ENTER where there is a comma

10, 10, 50, 10, 50, 60, 10, 40, 10, 10, 225, 100, 40, 160, 40, 130, 100, 100, 40, 255, 255, 0.

Now use RANDOMIZE USR 64891 to display a box and triangle to screen If you compare the data with the flowchart you will notice (a) that this mode is called when NO 255 starts the sequence, (b) The first pair of numbers are the PLOT coordinates, subsequent pairs being **absolute** DRAW coordinates, i.e. you give the **actual** coordinates you want to draw to. No more messing about with positive/negative offsets (c) a 255 starts a new PLOT position, (d) two 255's means return to the driver Note that you cannot PLOT/DRAW to) or 255 You don't need to anyway as the routine draws a border around the picture area (This becomes very important in the FILL mode)

Fill

This mode 'inks in' the pixels within an area bounded by lines. As you will need an area to fill alter the FOR/TO numbers in the loader line to 40021 and 40030 and add the following data

255, 255, 57, 11, 15, 58, 100, 42, 255, 0

RANDOMIZE USR 64891 to redraw the square and triangle and fill them with red and blue inks Work out how it runs using the flowchart remembering that the attribute values are ink + paper * 8

One or two points to note when using fill (a) the area to be filled must be **completely** enclosed The smallest gap and FILL leaks out There may be "invisible" gaps along a line. You can close these with an extra PLOT DRAW but often just moving the start position of the fill will solve the problem (b) In order to be very fast the fill is only semi-intelligent so you need to have the start position against a left or right boundary You will also need to have more than one start point to fill shadowed areas (eg filling a ring) and the fill may not spread to very narrow areas. Either complete these with PLOT DRAW or don't have narrow areas! Finally it is just possible to crash the routine so save the drawcode before trying it out

TABLE B

17	34	255	26	103	19	26	111	32	220	225	201	125	230	192	31
6	4	197	19	26	71	19	26	55	31	15	173	230	248	173	87
79	213	205	21	254	209	193	16	124	7	7	7	173	230	199	173
241	17	63	156	19	26	254	0	7	7	95	124	230	7	71	4
200	254	255	194	234	253	19	26	62	254	15	16	253	71	26	160
254	255	194	196	253	19	26	50	168	47	18	201	237	75	125	92
143	92	19	26	111	19	26	193	197	17	0	255	120	130	71	254
213	34	125	92	205	151	254	209	255	40	114	254	176	40	110	197
19	26	222	255	32	232	195	151	205	170	34	60	71	197	125	7
253	26	50	45	255	19	26	50	16	253	193	15	56	14	13	16
46	255	19	26	50	47	255	19	250	125	43	230	31	126	40	4
26	50	50	255	19	26	50	51	6	8	24	239	8	62	9	144
255	213	205	44	255	209	19	26	71	6	7	48	17	12	29	40
222	255	32	221	195	151	253	26	67	16	247	35	125	230	31	126
103	19	26	71	62	176	152	111	40	56	6	6	24	236	30	255
19	26	71	19	213	26	57	62	12	227	105	227	8	253	126	87
176	154	79	205	21	254	209	19	15	15	47	230	1	79	8	177
26	222	255	32	236	19	26	222	28	16	17	119	229	213	205	219
255	32	230	195	151	253	1	0	11	203	225	35	125	230	31	40
1	1	197	205	111	254	193	17	16	6	8	126	7	48	232	15
1	1	120	148	48	4	21	21	7	16	253	119	213	205	219	11
237	68	71	121	149	48	4	29	209	193	24	136	193	122	254	1
29	237	68	79	176	200	121	184	200	17	0	1	193	24	136	0
229	98	107	34	19	254	46	0	175	255	175	255	0	0	0	0
56	4	101	107	72	71	34	17	175	62	32	1	15	10	17	12
254	98	120	203	63	111	125	129	6	32	223	87	213	17	32	0
56	3	184	56	8	144	111	207	4	25	16	253	65	4	35	16
91	19	254	24	5	111	237	91	253	209	66	229	72	67	119	35
17	254	227	124	130	103	125	131	16	252	225	213	17	32	0	25
111	197	205	111	254	193	227	37	203	65	16	239	201			

(Of course, once you have it working correctly it won't crash when in use in a program).

Block

This effectively "papers in" a block of character squares. After the FOR/TO numbers to 40000 and 40007 and enter the following sequence, which produces a blue block, 10 by 5 with top left corner at row 15, column 1 255, 14, 15, 1, 10, 5, 255, 0

As before RANDOMIZE USR 64891 will display it. As it is the attribute number which is used this mode can be used to change the ink within an area without affecting the paper, and so alter just the outline colour

If you want to see a large picture drawn with Speedraw use the loader line (with FOR/TO set to 40000 and 40250) to enter the data from **Table C.** RANDOMIZE USR 64891 will quickly display a Hobbitish path in the Misty Mountains leading to the Golden Key that you don't need anyway (Oops — Sorry!) If you look carefully you'll see that the sky top left is BLOCKed not FILLed this is so you can FILL the moon. (Remember you can't have INK on INK)

When using Speedraw in your own programs you'll need to set the data start register to the beginning of the drawcode you want it to read. Do this with the subroutine

1 RANDOMIZE a: POKE 64917, PEEK 23670: POKE 64916, PEEK 23671: RANDOMIZE USR 64891:

RETURN having first set variable a to the data start address **less 1** of the drawcode you wish to use

You probably worked out by now that to produce an accurate drawcode will take a lot of working out on pixel paper. This cannot be avoided but I can offer you some help in the form of an Editor/Assembler which will find and help you correct the errors. The listing is too long to include here, but if you're interested in finding out more about it write to me care of ZX Computing enclosing an SAE

Next time we'll return to the picture element idea and produce those promised 'Lords of Midnight'-type landscapes at only 30 bytes each

Till then, happy drawing!

TABLE C

68	159	115	159	115	158	58	153	255	175	71	154	22	255	183	39
56	159	67	159	71	174	255	56	183	17	255	83	174	80	160	255
159	38	52	44	47	55	44	78	143	174	128	128	255	193	174	160
43	74	34	76	33	88	30	167	112	255	220	174	200	88	255	254
24	144	23	152	22	160	19	164	168	247	112	232	64	255	32	167
15	165	10	164	7	159	1	255	33	166	28	162	27	156	28	149
124	174	112	152	109	144	112	129	33	145	39	144	36	150	35	156
120	132	127	167	159	111	199	37	36	162	39	167	36	166	255	1
215	77	251	63	247	39	254	24	174	4	170	17	142	31	123	40
255	110	152	106	148	104	142	107	115	47	112	1	112	255	47	174
135	112	126	144	104	157	93	176	47	111	255	48	114	48	130	50
72	132	56	184	39	184	31	176	130	50	120	49	120	49	130	255
15	166	1	255	84	157	57	45	255	255	0	0	0	6	0	255
255	102	141	74	34	75	33	103	255	255	8	1	119	48	1	1
141	255	119	119	96	29	255	143	49	48	174	14	28	156	50	169
103	126	25	255	167	79	146	21	1	255	0					

THE FUTURE IS HERE!

What better way to plan your adventures for 1987 than mark them on a stunning Level 9 year planner. Fifty ZX readers can rhyme their way to a prize.

"There once was man called Clive,
Who one morning brought the Spectrum olive,
He thought 'Oh well, I'll invent the QL',
And before lunch I'll create the C5."

One of four Godfrey Dowson illustrations that feature on the year planner

This shining example of how to write a limerick (okay there may be a few poetic bugs in it) should give you some pointers towards creating your own rhyming masterpiece. To adorn your wall with a Level 9 year planner all you have to do is complete the limerick below. Remember the last line must rhyme with the first two and the third and fourth with each other. Getting the right rhythm is important and prizes will go to those who have thought up the most apt and humorous ending.

The wall chart is fully laminated and washable and comes with a fibretip pen to pencil in your important engagements. Apart from being extremely useful the planner is decorated with four superb full colour illustrations by Godfrey Dowson.

Level 9 Yearplanner Competition

A spokesman for Level 9,
said adventures are truly divine,

_____

_____

_____

Name _____

Address _____

Post to Level 9 Yearplanner Competition, ZX Computing Monthly, No. 1 Golden Square, London W1R 3AB.

The limerick

Time to get into limerick mode. The first two lines are:
A spokesman for Level 9,
said adventures are truly divine,

Now it's over to you to complete the last three lines. The competition is open to all ZX readers apart from employees of Argus Specialist Publications, Alabaster Passmore and Level 9. The closing date is December 5th 1986. Please remember to write your three lines on the back of your entry envelope.

Send your entry to Level 9 Yearplanner Competition, ZX Computing Monthly, No. 1 Golden Square, London W1R 3AB.

REVOLUTION

Masterly graphics, infuriating puzzles — all you ever wanted from a bouncing ball game.

Revolution
Vortex/U.S. Gold
£9.99

Costa Panayi, author of many of Vortex Software's previous hits, has made a change in direction after his recent games Alien Highway and Highway Encounter and come up with another winner.

Revolution is one of those games which is quite simple to play (in principle anyway), but very difficult to master and absolutely infuriating when you get into the later levels of the game where you can see what you want to do but can't quite pull it off in time.

The game is played on a multi-tiered structure consisting of eight levels, and your task is to start on the bottom level and work your way to the very top. Each level is made up of an assortment of platforms, all on the same level but separated by gaps which have to be avoided. These platforms are arranged in a roughly square arrangement (which changes in each game) with the occasional empty position which you might find yourself plummeting into if you look before you leap (each of these levels is a bit like one of those sliding square puzzles in which you can move the squares around to try and form a picture or sequence of numbers).

You control a ball which can be bounced around the platforms and in order to complete a level and progress to the next you have to solve four puzzles. Scattered around each level you will find four platforms which carry various brick like structures and shaded pathways. On each of these platforms there are two grey blocks which turn white when you bounce into them and deactivate them. Each brick will remain deactivated for just a few seconds before reactivating and turning grey again, but if you can get both bricks deactivated at the same time then they will both vanish — problem solved ▶ ▶ ▶

REVOLUTION

and you can move on to the next problem on that level.

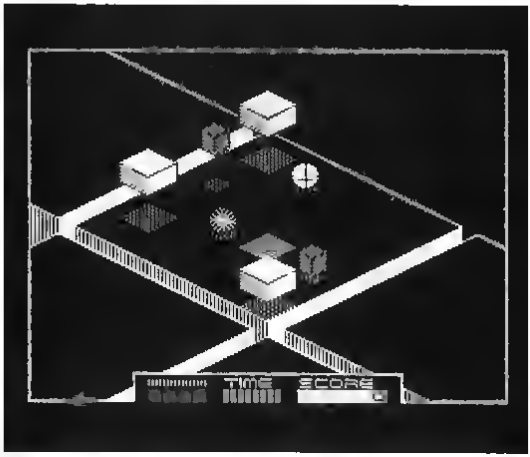
Unfortunately you've also got to contend with the shaded pathways on these platforms, and these can have different effects varying from just killing your bouncing or grabbing the ball and shooting it over the edge of the platform into oblivion.

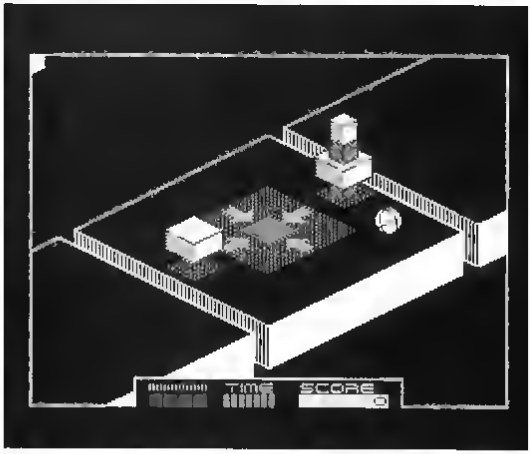
At the start of each level you are shown your position within the overall structure, as well as a map of the particular level that your are on. This map highlights both your own starting position and the position of the puzzles on that level so you've got a few tips to start off with. When you see this map it's also a good idea to make a mental note of the empty positions, as I found that I often went bouncing from one screen to the next only to find myself bouncing into nowhere. You only get five lives (though there are additional ones for completing levels) so you can't afford to do that too often.

Controlling the ball is an art all in itself. It can move in any direction that a joystick handle can move in (a joystick is almost compulsory for this game I should think), and responds very smoothly to joystick control but judging the height and distance of your bouncing is a skill that will take a lot of refining, especially on some of the trickier puzzles where you've got to squeeze the ball through some quite tight spots.

There are four different heights of bounce, controlled by using the fire button, or you can kill the bounce altogether and just roll along the surface of the platforms. There is also a variety of flying objects which patrol each level and though few of these are deadly you can find yourself accidentally colliding with one and bouncing off in a totally unexpected direction.

The graphics are mostly in just two colours to avoid attribute clashes, but as with Vortex's Highway games the graphic style is quite distinctive, making good use of fine shading effects to create clear and detailed pictures. But where I found the Highway games to be a bit too fast and furious for my gin-addled reflexes, Revolution is the sort of game that each player can play at his or her own pace. If you want to go bouncing around the platforms like a loony you're quite free to do so, but if you're content to take things a little bit slower and just roll slowly around while you try and figure out which way is up you can do that too.





At £9.99 Revolution is a bit pricey, but it's more likely to provide a long term challenge than most other arcade games around at the moment.

Revolutionaries

ZX talks to Salford based software house Vortex about the intricacies of Revolution.

Revolution, a complex 3-D brainteaser is a real test for puzzle solvers as the game layout subtley changes with each new game. Luke Andrews of Vortex explained the evolution of Revolution.

"Firstly it was essential to create the game in 3-D. It offers an attractive illusion and greater scope for complicated gameplay. The bouncing ball idea was really a progression from Highway Encounter but we wanted to do something completely different with it.

"The idea had been around in Costa's head for over a year until he got the confidence to create such a game. What happens is that Costa comes up with an overall graphic treatment and we discuss ideas and ways of creating improved gameplay.

On the level

"The levels idea came at a later stage. We knew the bouncing ball was going to be the main character but we wanted an alternative to a long drawn out game on one level and something different from the usual map. With the idea of the levels we solved both problems. This way you could identify where you are and the overall layout very simply."

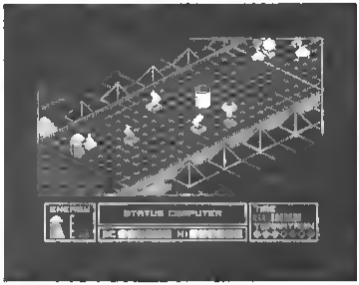
One of the infuriating aspects of puzzle based games is laboriously working through the puzzles you've already solved to get back to the position you reached in your previous forays. In Revolution this problem doesn't arise.

"There are eight layouts in the stack and the chances of meeting those layouts in the same order twice are 1 in 10,000. Theres also a checkerboard layout that you encounter in the later levels. The random element is built in in two ways. Firstly the puzzles are mixed up in the various levels and secondly you may find one puzzle on an early level and again later but you will have less time to come up with the solution.

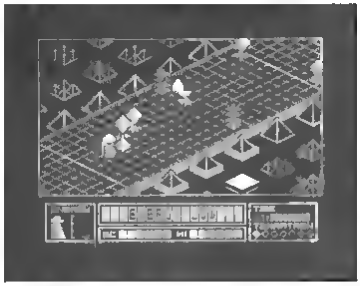
Complications

"Programming games like this presents immense difficulties and although most of them are ironed out in the early stages. One problem was that when the ball was perched on an object it would just fall off rather than roll or pop up. It was solved, but getting the ball to look convincing and realistic was perhaps the hardest part.

Vortex: Costa Panayi, Luke Andrews and Costa Panayi



Vortex's Alien Highway. Scheduled for budget re release on U.S. Gold's Americana label



"The idea of touching the two blocks to solve the puzzle came about half way through the development. The three of us have been together for about four years now and when an idea comes up that we like we all get enthusiastic. If any of us hesitate then we ditch it. With the blocks we knew it was the vital ingredient we needed."

THE PROFESSIONAL TOUCH

This month, Hewson's Steve Turner has some advice on how to Supercharge Your Spectrum.

In the past two years the standard of Spectrum programs has increased dramatically. To compete in today's market you have to push the Spectrum to its performance limits. This month I'll look at a few tricks of the trade that can be used to realise the full potential of the 48K machine.

Increasing user RAM

To use all of the RAM apart from the screen and attribute maps you must shut off the Spectrum ROM. Every 50th of a second a hardware timer causes an interrupt. This has the effect of giving control to the ROM keyboard scan routine. This interrupt needs to be switched off with a disable interrupt instruction. Of course no ROM routines can be used or the Spectrum ROM variable area may be corrupted (I have always avoided using ROM routines. It is usually much better to design your own routines that do exactly what is required).

You can also use more RAM than there is! This is achieved by using areas twice. Routines and data only used at the start of the program can be overlaid with other routines loading over them. In AVALON for example, the code for keyboard choice, displaying the pretty border and initialising everything is overwritten by the main game.

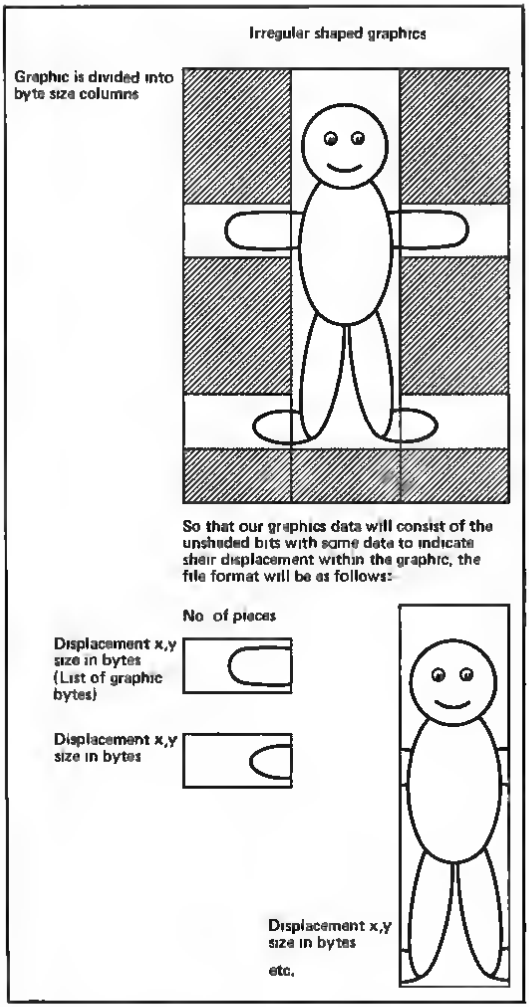
Both of these methods are best implemented in the final stages of testing. Once applied the game is in a 'live' state and can only be started once. It is also extremely difficult to get back to BASIC.

Reducing the size of your code

It is best to write code using as few bytes as possible from the outset of coding. This has to be balanced with clarity and execution speed requirements.

Here is a list of tips to reduce the size of your code.

1. Use **XOR A** instead of **LD A,0**
2. Use **AND A** instead of **CP A,0**
3. Structure your programs to avoid unnecessary repetition
4. Make large macros into subroutines.
5. To increment counts etc make use of **INC (HL).**
6. Use block moves and compares' when appropriate.
7. Use table-driven processing so that each routine performs a greater range of tasks. For



instance, instead of coding a movement routine for each object in a game tabulate the movement characteristics, then write a general routine that accesses the table and produces a different result for each entry

Reducing the size of data

When designing data tables bear two things in mind, how often will the data be used and how tightly can it be packed?

Generally packing data means a slower access time so often a compromise is necessary. Here are the techniques I use.

1 Use variable length data records where you can
2. Use ROM or Machine code as table data as 'free' data. Background wall objects in AVALON were chosen and placed using ROM as a data table, and I adjusted the data to be in the required ranges. It is similar to using a random value except if you get the same value whenever you want it
3 Design the data so that as much information as possible can be deduced from the record number. In AVALON room colours were a function of room number
4 Do not include the record number in the record. The program either knows it or can deduce it from the record's position
5 Look for common or repeated data and group these records, specifying the common ones.
6 Pack maps or suitable data and unpack them into a buffer for fast access.

Reducing RAM usage of graphics

Graphics data usually takes up a major part of the RAM in a state-of-the art arcade game. The graphics, when used, may have to be accessed many times a second, so we must decide which graphics we can pack and which have to be in a format suitable for fast plotting

One of the easiest ways of getting more graphics in the program is to use custom character sets as building blocks. Large graphics can then be constructed from the characters. A data record for each object specifies its dimensions and which characters it is made up of. If most of the characters are used many times the RAM savings are considerable.

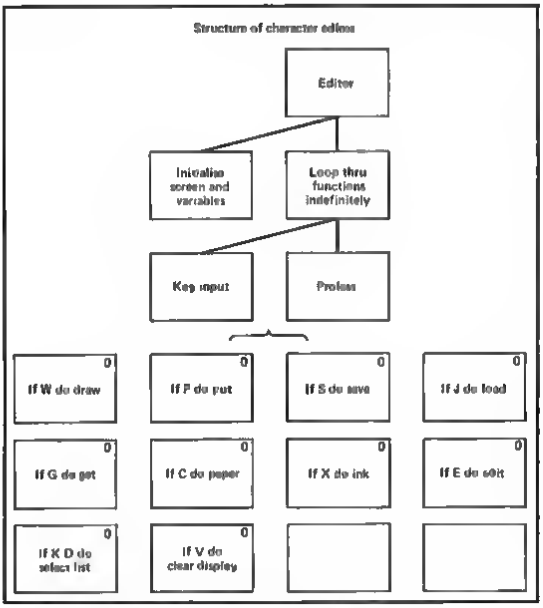
An extension of this idea is to use a building block larger than a single character. This system could be used to program a game like Knightlore and its derivatives. Each 3D block could be one of the basic building graphics. By plotting them on top of one another, walls, towers and arches can be constructed

The choice of the shape and the size of building block depends on the style of the game. I have used variable size blocks which lead to a very flexible system. You can even build macro blocks out of small blocks using even less RAM though there is a price to pay. The CPU has more work to do to decode the data and build the graphics. This is why Quazatron only scrolls slowly. The poor CPU is busy constructing the bit of the picture moving into view

Another way to optimise space used by graphics is to design a graphics format that caters for odd shaped objects. This also saves the CPU time as it does not have to waste time plotting blanks.

Increasing execution speed

The place to concentrate an



speed optimisation is in the innermost loops of the program. One instruction saved here can be the equivalent of thousands of instructions saved elsewhere if you can identify the routines that are used the most. It is sometimes useful to get an idea of how long a routine is.

To do this code a **HALT** instruction and set the border to a different colour. Restore the border to its original colour after the timed routine has finished, then repeatedly call the routine. In most cases the routine will already be in some sort of loop and the program can be run as normal. The size of the coloured stripe on the upper border gives an indication of execution time. If the routine executes for more than a 50th of a second the whole border will flash the chosen colour.

Usually the place where speed is most required is in the graphics plotting routines. In my games the CPU spends about 90 per cent of its time driving the picture on the screen. The design of the graphics routines makes or breaks a Spectrum game, so I will delve into the theory of animation so that the problems can be identified.

Animation

Animation is moving pictures. It is achieved by replacing one picture with another in quick succession, the more frames per second the smoother the animation. This is done by building up a new picture or part of a picture off screen. Background objects are drawn first, foreground objects last. Finally this new frame is copied to the screen.

The speed is affected by the size of the buffer or buffers that are built and copied. This is why so many games reduce the size of the moving screen area. The cleverest games manage to maintain a large moving area by just plotting the parts of the screen where changes occur.

The routines that clear, build and copy the buffers are worth optimising. This is where the crattiest techniques are employed. Let us examine the various methods applied to clearing a buffer to zeroes.

Using a LDIR instruction to copy the buffer to itself is a good method but not the fastest. It takes 21 cycles for each of the bytes to be cleared plus setting up overheads. If interrupts are disabled the stack pointer can be used to PUSH two zeroes a time into the buffer. It only takes 11 cycles for each two bytes cleared plus 27 cycles as a loop control. If several PUSH instructions are coded in a list then the 27 cycle loop control does not have to execute for each two bytes cleared. The longer the list of PUSH instructions the faster the routine. Space considerations usually force a compromise.

```
  10 LLEAR 44999
  20 BORDER 6  PAPER 6  INK 0  CLS
  30 LET a$="" : LET c=0 : LET d=c : LET x=c : LET y=c : LET b=c : LET d=c
LET e=c : LET f=c : LET g=c : LET h=1
  40 PRINT AT 0 4;"CHARACTER EDITOR   CHR$ LIST"
  50 GO SUB 100
  60 PRINT AT 3,11 "W=DRAW";AT 4,11;"G=GET P=PUT" AT 5 11;"E=EDIT";AT 6,11 "S=SA
VE" AT 7,11;"J=LOAD";AT 8,11,"K=LIST" AT 9 11,"X=INK C=PAP" AT 10 11 "V=CLEAR P
C"
  70 PLOT 15 160  DRAW 65,0  DRAW 0,-65  DRAW -65,0  DRAW 0,65
  80 PLOT 0,80  DRAW 183,0
  90 PLOT 183 0  DRAW 0,175
  95 GO SUB 2000
 100 REM function loop
 110 IF a$="W" OR a$="w" THEN  GO SUB 400  GO TO 100
 120 IF a$="P" OR a$="p" THEN  GO SUB 4300  GO TO 100
 130 IF a$="S" OR a$="s" THEN  GO SUB 5000  GO TO 100
 135 IF a$="J" OR a$="j" THEN  GO SUB 5000  GO TO 100
 140 IF a$="G" OR a$="g" THEN  GO SUB 4000  GO TO 100
 150 IF a$="C" OR a$="c" THEN  GO SUB 8000  GO TO 100
 160 IF a$="X" OR a$="x" THEN  GO SUB 7000  GO TO 100
 170 IF a$="E" OR a$="e" THEN  GO SUB 300  GO TO 100
 175 IF a$="K" OR a$="k" THEN  GO SUB 500  GO TO 100
 177 IF a$="V" OR a$="v" THEN  GO SUB 3000  GO TO 100
 180 GO SUB 200  GO TO 100
 200 REM EDIT CHARACTER
 305 LET i=k+(32*y)+22504
 306 LET j=120  IF PEEK i=0 THEN  LET j=16
 307 POKE i, j
 310 GO SUB 9900
 320 IF a$="B" OR a$=" " THEN  PLOT  OVER 1;96+x,159-y: GO TO 370
 336 LET j=0  IF PEEK i=120 THEN  LET j=40
 337 POKE i, j
 339 IF CODE a$>58 THEN  RETURN
 340 LET dx=dx+x  IF dx>=0 AND dx<8 THEN  LET x=dx
 350 LET dy=dy+y  IF dy>=0 AND dy<8 THEN  LET y=dy
 360 GO TO 300
 370 LET j=16  IF PEEK i=16 THEN  LET j=120
 375 IF INKEY$<>"" THEN  GO TO 375
 380 GO TO 307
 400 REM DRAWING
 405 LET i=PI+(32*b)+22912
 410 POKE i,10*PEEK i
 420 GO SUB 9900
 450 POKE i,E+(8*b)
 460 IF CODE a$>58 THEN  RETURN
 470 IF a$="B" OR a$=" " THEN : LET k=45000+(c+f*8) : FOR i=0 TO 7 : POKE USR "a
"+i,PEEK (k+i) : NEXT i : PRINT AT 12+b ; INK e; PAPER d;CHR$ 164 : GO TO 900
 560 LET dx=dx+x  IF dx>=0 AND dx<32 THEN  LET a=dx
 490 LET dy=dy+y: IF dy>=0 AND dy<10 THEN  LET b=dy
 495 GO TO 900
 500 REM select char
 510 POKE 22583+(33*c),240
 520 GO SUB 9900
 530 POKE 22583+(33*b),100
 540 IF CODE a$>58 THEN  RETURN
 545 POKE 22583+(33*c) 80
 550 LET dx=dx+c  IF dx>=0 AND dx<20 THEN  LET c=dx
```

```
 560 IF c=dy THEN  GO TO 500
 570 IF c=d AND k<20 THEN  LET c=13: LET k=k-20: GO SUB 1000  GO TO 500
 580 IF c=13 AND k<1000 THEN  LET c=0: LET k=k+20: GO SUB 1000  GO TO 500
 590 GO TO 500
1000 LET k=45000+(k*8)
1010 FOR r=0 TO 19
1020 FOR l=0 TO 7  POKE USR "u"+l,PEEK (k+l)  NEXT l  PRINT AT 1+r,23;CHR$ 144;"
 ";4+r;"  "
1025 LET k=k+8  NEXT r
1027 POKE 22528+(32*c),120
1030 RETURN
3000 REM CLS BOTTOM AREA
3005 INPUT "CONFIRM CLS Y=YES ";a$
3010 IF a$="Y" OR a$="y" THEN  FOR L=11 TO 21: PRINT AT L,0;"                  "  NEXT L
3020 LET a$="u"  RETURN
4000 REM get char from list
4010 LET k=((m*c)*8)+45000
4020 LET h=16450
4030 FOR l=1 TO 8
4035 LET d=PEEK k: LET x=k+1
4037 POKE h,d: LET h=h+256
4040 FOR m=1 TO 8
4045 LET f=0  LET d=INT (d/2)  LET f=f-(d=0)
4050 LET j=0  IF f=0 THEN  LET j=48
4055 POKE (22528+h)+(32*L),j
4060 NEXT m
4070 NEXT L
4075 LET a$="E"
4080 RETURN
4500 REM copy char to list
4510 LET k=((m*c)*8)+45000
4520 LET h=16450
4540 FOR L=0 TO 7  POKE k+l,PEEK (n+(256*l))
4550 POKE USR "u"+l,PEEK (k+l)  NEXT L
4560 PRINT AT 1+c,23;CHR$ 144
4565 POKE (22528+(32*c)),120
4570 LET a$="E"  RETURN
5000 REM SAVE
5005 INPUT "NAME ";a$;" LAST NO ";b
5010 SAVE a$CODE 45000,080
5020 GO SUB 4000
5030 RETURN
6000 REM LOAD
6005 INPUT "NAME ";a$;" FIRST CHARACTER NO ";b
6007 LOAD a$CODE 45000+(b*8)
6010 GO SUB 1000
6020 LET a$="e"  RETURN
6025 INPUT "PAPER";c  IF c>7 THEN  GO TO 3000
6030 LET a$="u"  RETURN
6040 INPUT "INK";c  IF c>7 THEN  GO TO 3000
6050 LET a$="s"  RETURN
6060 LET a$=INKEY$  IF a$="" THEN  GO TO 6060
6070 LET d=0  LET dy=0
6080 IF a$="5" THEN  LET d=-1
6090 IF a$="8" THEN  LET d=1
6100 IF a$="7" THEN  LET dy=1
6110 IF a$="6" THEN  LET dy=-1
6120 RETURN
```

If interrupts are enabled slower methods have to be used such as listing LD (HL) A and INC HL instructions or LDI instructions.

Fast and slow

It is worth designing your program so that heavily used data and routines do not occupy the lower 16k of RAM. This is because all RAM from 4000h to 7FFFh is considered by the hardware as the screen bank of memory. Every time the video hardware requires a byte to put out to the TV, and the CPU is fetching data from the lower RAM, the CPU is temporarily stopped in mid instruction. This can make it 30 per cent slower.

Character Generator

This month's program is a BASIC utility I use to design graphics made out of character size building blocks. It can also be used to design custom character sets. It includes a load and save routine so that sets can be stored on tape or, with a small change, to disk or microdrive. To use one of your custom sets in BASIC programs POKE the Spectrum variable CHARS with 256 less than the address where you load the character set (see page 173 of the Spectrum manual)

MOONLIGHT MADNESS

Bubble Bus
£7.95

I always used to hate, loathe and utterly detest Bob-a-Job Week when I was a cub scout, and judging from the scenario of this latest Bubble Buss title, things haven't changed much over the last twenty years. Having wandered down a huge drive to an old mansion, you ring the bell whereupon your coil is answered by an even older man. He explains that he is a mad professor and is somewhat surprised that you have got even this far, having managed to avoid his guards and booby traps. Such is his surprise that he promptly drops down with a heart attack although not before blurting out that his pills are locked in the safe and you will need sixteen keys to open it.

Honestly the lengths some people will go to in order to avoid paying up but you nobly decide to do your good deed for the day and try and get the pills. The mansion consists of a series of doors, switches, platforms and monsters and your task is to wander round collecting the keys and generally avoiding getting killed. If you are standing next to a door, pressing fire will move you through into the room behind. Stand next to a switch though and the fire activates the appropriate mechanism. Not all of these are beneficial so the temptation to go round pressing everything in sight must be avoided. Typical effects include building extra platforms, activating lifts and mobilising monsters. Getting to where you want to go often requires both timing and planning. One annoying feature is that certain doors lead to a row of eight doors with a large pair of eyes above. This is some sort of maze and it is possible to get out again if just takes some patience. So frustrating is this element of the game that two people who tried the game thought it was a bug and reloaded the game (there is no way to abort your current game).

Other features are annoying too. You can redefine the keyboard but the pause and music on/off keys are not affected so I found that every time I tried to move right I paused the game. This is just bad programming and something that should have been picked up in playtesting. The game looks and plays very much like Booty which is no great surprise as John Cain wrote them both. Like Booty Moonlight Madness would be all right at budget price but is not very good value as it stands. Keeping to the boy scout theme, be prepared before you buy this one.

GRIM

THE HAPPIEST DAYS OF YOUR LIFE

Firebird Silver
£1.99

Firebirds latest pocket money game is a schoolboy caper featuring an animated scally-wag out to retrieve the headmasters wallet that he's nicked and then fart. Can he avoid expulsion? This largely depends on your ability to steer him through the school building and grounds searching for clues to the whereabouts of the heads dosh.

All the basics of the game work well enough, the graphics are large and bright and despite the odd annoying attribute clash quite pleasing to look at. The number of rooms and outside locations is quite surprising and is quite a lot of fun just exploring. There are no really nasty surprises as the flying energy suppers such as hovering ones and twirling jellies in the school kitchen present little hazard. You can pick up any two objects of which there seem to be an almost unlimited supply. Quite which objects were meant to help you eluded me and all you get from the instructions are some rather cryptic hints such as, "map your way to the secret passage, turning over a new leaf en route".

However if you like problem solving games in the hunt the object type vein this will probably appeal. Well worth the price on presentation alone it may not give you the happiest day of your life or even a wildly exciting one but if you want to settle for an afternoon of quiet diversion this game will do.

GOOD

BUMP, SET, SPIKE

Mastertronic
£1.99

Here's something a little different for sports simulation fans — doubles volleyball! This latest offering from Mastertronic's Entertainment USA range is a highly enjoyable game and the first attempt to my knowledge to put volleyball on the Spectrum.

You are in control of two players against a pair controlled by the computer. It's a keyboard only game and you define your own keys. It's deceptively simple however to work out the best arrangement of keys so that you can switch easily between your two players. I had to redefine them several times before I found an arrangement that meant I wasn't accidentally hitting the wrong key. This I should add was down to my cackhandedness. To get good team work between your two players rather than just bashing the ball back first time requires a lot of dexterity on the keyboard.

Controlling the ball is quite simple. When the ball comes to your player and you are in a position to hit it you press the fire key and a cross is shown going up the court to where the ball will land. Release the fire key and the ball is on its way. It's not perhaps the most sophisticated of games but there are some nice touches — for instance if you hit the ball high into the air it crosses unexpectedly in front of the scoreboard at the top of the screen.

One game playing tip which is not down to my skill but rather an oversight in the programming is that there are blind spots from where the computer opponents seem unable to return the ball. If you serve on the left hand side of the court to a point just inside your opponents baseline they are stymied. Using this tactic will of course take a lot of the edge off the game if you choose to exploit it but its handy if you need a vital point and certainly doesn't detract from the game if you are sparring and choose to ignore the computers achilles heel.

The animation is fair and as simulations go it's pretty representative of the game itself even though its only two a side (but as even doubles will give you a bad case of entangled fingers two players are certainly enough).

For the enjoyment it gives it's more than good value for the price and seems to suggest that there is potential for someone somewhere to produce a fully fledged full price volleyball simulation. For now though Bump Set and Spike is in a class all by itself.

PS There is however one curious feature about the game. The crowd, who are totally immobile throughout all seem to be wearing white masks over their faces and the entire game looks as though it's being playing in front of a gathering of the Klu Klux Klan or are my eyes deceiving me?

GREAT

GAMES

SGRIZAM

Americana
£2.99

Not only does this game have an absolutely unpronounceable name, it's also virtually unplayable — or at least it's not a game that I can imagine anyone wanting to play

Supposedly set in the 25th century Sgrizam casts you in the role of the warrior Mirdav who has been entrusted with the task of rescuing the Princess Doxaphin. Naturally being a princess, Doxaphin (Doxie to her friends no doubt) is dead beautiful and if you can rescue her you get to win a huge dowry and her hand in marriage, so off you go to rescue her from her captors on the planet Kindos.

Tucked away in a cell in the Castle of Kindos, Doxaphin can only be rescued by you battling your way along the corridoors, dodging or killing the creatures that will stand in your way. These include zamble ducks, swordsmen snakes, rats and the like. Most of these can't be killed, but by ducking or jumping at the appropriate moment you can avoid them

Getting hit three times ends the game and whenever I or anyone else played Sgrizam each game lasted about three seconds.

The trouble is that there's so little game in here — you can walk along the corridoor, jump/duck to avoid the animal or jiggle your sword in the direction of one of the armed enemies that comes along occasionally and that's about it There doesn't seem to be much skill involved in the sword-play and simply avoiding the stream of creatures that comes wandering along (always from the same direction so you don't even get to run backwards and forwards to add a little variety to the game) gets monotonous in a very short time

The graphics are quite good for a budget game, and Mirdav is a large, well animated sprite that wouldn't look out of place in a more sophisticated arcade/adventure. It's just a pity that the gameplay itself is so dreary

GRIM

RETURN TO OZ

US Gold
£7.95

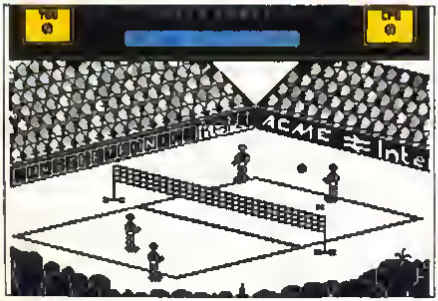
Yet another spin off from a film title and no, it's not about going back to Australia, but rather it involves that magical land of Yellow Brick Roads, Emerald Cities and the Wicked Witch of the West Some time has passed since your first visit and you are desperate to return to see your friends, especially as you have a feeling that all is not quite as it should be with the Cowardly Lion, the Scarecrow and the Tin Woodman The problem is, Aunt Em wants you to stay firmly put in Kansas and doesn't like you even mentioning Oz.

The game is a menu driven graphic adventure that is designed to appeal especially to young children There is nothing to type in apart from your name at the beginning and everything is controlled by just three keys — space to highlight a particular option from the menu, enter to select that option and shift to return to the main menu There are six main options to choose from, Look, Talk, Search, Get List and Leave. The list option (inventory) is further subdivided into Quit, Drop and Use. When you select an option all the relevant items on the screen are highlighted and again the space bar switches between them

The main problem with the game is that the graphics are truly awful Pictures of what you have found are small and not easily distinguished and items or areas that are supposedly highlighted remain indistinct and wishy-washy There are also difficulties in using the space bar to highlight different objects but this may be a peculiarity of my rubber keyboard Certainly, I found that I had to press the keys up to half a dozen times before the next item was highlighted and it would be all too easy to dismiss something as not significant because you couldn't select it

The game is designed to make adventuring easy, but I found that it had just the opposite effect and my frustration increased considerably, the longer I played As for the story it follows the film closely but I think that you would have to be a real fan of the film to get much fun out of the game. One final quibble All over the packaging are notes crediting the Walt Disney organisation who produced the film but there is not a single mention of L Frank Baum the original author Take my advice and go and read the book instead

GROAN



THRUST

Firebird
£1.99

I'd seen this played on the C64 and I'd heard some good things about it, so I was interested to see a Spectrum version of Thrust turn up in the office a little while ago.

Thrust is a simple enough game, and quite old fashioned in many ways, being a sort of cross between Asteroids and Lunar Lander. The game puts you in control of a small space craft shaped like an upside down 'V' which hovers above the surface of a planet. At first it is slowly drifting down towards the ground, but quite quickly speeds up as gravity draws you downwards. Using the rotate left/right and thrust controls you have to guide your craft over the surface of the planet and collect the energy pod.

Controlling the craft is difficult enough, as theres gravity and your own momentum to contend with but there's also the problem of the Lympet guns which defend the pods. The guns are powered by nuclear plants and if you can fire enough shots at the plants the guns can be deactivated temporarily, but if you overdo it you'll end up sending the plant critical and destroying the whole planet (which isn't a good idea).

Then add to all that the problem of your every decreasing fuel supply and the tricky task of collecting additional fuel from the supply pods on the surface and you're faced with a game that is made up of several simple tasks which combine to make quite a tricky game. Hovering over the planet isn't too hard and neither is picking up the fuel or energy pods, but when you try to do both these things and conserve your fuel and dodge bullets at the same time, that's when things start to get tricky.

There is just one pod on each planet and once you've collected that you just head skywards and the game will move you on to the next planet. The first couple of planets aren't too much trouble, but on the later planets the pods and spare fuel get hidden away in deeper and more complex caves, and are protected by more and more guns, so it's not a game you'll master in a few minutes.

The graphics are quite simple, but the animation and responsiveness of your craft are all quite smooth (and at least the simplicity of the graphics allows you to avoid attribute problems). My only doubt about the game is that because you have to go through all the planets in a fixed order you might get a bit fed up going through all those early planets in order to master the later ones. Oh and once you've chosen your control keys you can't redefine them without starting from scratch and reloading the game again so it's not a good idea to play the game with a friend unless he/she wants to use exactly the same controls.

Thrust is an old fashioned game that isn't going to set the world alight but it's been well enough thought out to be challenging and fun for a few rainy afternoons and it's probably one of Firebird's better budget releases of recent months.

THINGY AND THE DOODAHS

The standard of budget software seems to be varying quite a lot these days. On one hand there's a small number of games that make full price titles look overpriced but at the same time there are still a lot of budget games that really ought never to have seen the light of day.

Then on the other hand there are games like Thingy and the Doodahs which are neither incredibly good nor incredibly bad and which make a poor reviewer's life hell because you can't rave over them or indulge yourself by giving them a good drubbing. So what do you say about them?

Well the plot of the game goes like this. Thingy (a little sprite type person with an idiotic grin) has gone and broken his Spectrum and has to replace it with a new one before his parents find out. The only way for him to do this is to go off in search of the money to buy a replacement (just £60 apparently — do Americans know more about Amstrad's plans for the Speccy than they're letting on?) and this will take him on a journey around some 200 locations, including rooms in his house and the neighbouring countryside.

As usual though there are monsters out to get him. In this case it's a bunch of creatures known as Doodahs, which come in various types. There are Whatisnames, Thingummybobs, Whachamacallits and So and So, and they're all equally deadly.

Thingy is a good old fashioned maze game with £4 coins as the objects that you've got to collect. It's not badly done, but it does look fairly dated — most of the passage ways and monsters are small character sized blocks, making use of the UDG facility so the game looks reminiscent of others that you could have bought three years ago. It's not fast and furious, but dodging around the Doodahs and the passages of the maze is quite complex in places and the author has clearly put a bit of thought into the layout of all the rooms.

I can't really recommend Thingy and the Doodahs one way or the other. It's not such a bad game that you'll regret every penny you part with to buy it but neither is it the sort of game that is ever likely to be remembered two months after you bought it. The word that describes it best is 'average'.

Compatible with ZX Spectrum +2 • Compatible with ZX Spectrum +2 • Compatible with ZX Spectrum +2

Probably the best joysticks in the world

THE TOP PEOPLES CHOICE

125 +

The Explosive Joystick

Compatible with ZX Spectrum 16k 48k 128k +2
Commodore 64 Vic 20 Amstrad Atari etc

At only £8.95 the features on the 125 are second to none. Besides its unique internal structure built to withstand immense punishment from even the most vigorous games player the joystick contains no less than four extremely sensitive fire buttons. Two are housed in the handgrip which has been moulded for extra comfort and ease of operation. The trigger finger fire button provides ease and comfort for your finger and the top fire button is contoured to fit your thumb for sure fire shooting. The base fire buttons are positioned for extra control and two hand firing whether you are right or left handed.

A built in auto-fire switch provides continuous shooting at the touch of a fire button.

Including Spectrum+2 Selector Connector.

The 125 comes complete with a full 12 months warranty.

Prices include VAT, postage & packing. Delivery normally 14 days.
Export orders at no extra cost. Dealer enquiries welcome.
Cheetah products available from branches of

Dixons WHSMITH High St. Stores and all good computer shops

A Right Royal Joystick

DELUXE

Cheetah MACH I +

MICROSWITCH JOYSTICK

- METAL SHAFT
- AUTO FIRE
- +2 SELECTOR CONNECTOR
- 12 MONTH WARRANTY

ONLY £14.95

- Deluxe, robust construction
- Comfortable rugged hand-grip, 8 directional control with automatic centering
- Heavy duty base with strong stabilizing suction cups
- Highly sensitive light touch **MICRO SWITCH** fire buttons
- Ergonomically designed control handle with indestructable **METAL SHAFT**
- Built in **AUTO FIRE** function

Mach1+Joystick compatible with
- Sinclair ZX Spectrum 16K 48K 128K +2
- Amstrad computers
- Commodore 64 & VIC 20 Computers
- Commodore C16 & Plus 4 Computers (adaptor sold separately)
- MSX Computers
- Atari 2600 & Atari 5200 Video Game Systems
- Atari Home Computers

Prices include VAT postage & packing. Delivery normally 14 days. Export orders at no extra cost. Dealer enquiries welcome.
Cheetah products available from branches of Dixons WHSMITH High St. Stores and all good computer shops

Cheetah Marketing

CHEETAH MARKETING LTD
1 WILLOWBROOK SCIENCE PARK
CRICKHOWELL ROAD ST MELLONS CARDIFF
TEL CARDIFF (0222) 777337 TELEX 497455
FAX 0222 779404

Compatible with ZX Spectrum +2 • Compatible with ZX Spectrum +2 • Compatible with ZX Spectrum +2

SHORT CUTS

STAR CUT

Ray Elder presents another prize winning collection of readers' routines

Printing Windows

Robert Glavas, a regular writer from Bury, sent us an unusual program to allow you to print a section or window of the screen to a ZX or Alphacom printer. The Machine code is relocatable and once you entered or reloaded the program load in your previously save screen by LOAD "" SCREEN$ and type GO TO 1. Answer the prompt and the required window will be produced. (LISTING 1)

Reflections

Mark Batts of Abbots Langly supplied us with LISTING 2, a program to drive you round the bend. Try it

A Sound Program

Supplied by Michael Toner who lives in Belfast this short program LISTING 5, will liven up the old Beep. Once entered and RUN just type RANDOMIZE USR 65511 to have your ears tickled

Random Selection

Ian Skillen proves the ZX81/TS1000 is surviving in Chicago, but his routine for selecting non repeated random numbers over a set number of selection can be used on any ZX computer (LISTING 6)

QL Dump

A rare beast indeed from Mr LW Tomlin of Landon. More of a tip really but for slowly fading QL. He tells us that there is a screen dump utility on the EASEL cartridge called GPRINT_PRT and should work with any Epson type printer.

Load it by typing a=RESPR(2000) LBYTES MDV1_GPRINT_PRT,a

When you wnt to print a screen either from within a progra or after loading a predesigned screen simply type CALL a

I tried it with a Shinwa CP80 and it worked

Break & Display

From the Netherlands comes LISTING 3 and 4 courtesy of Rene Uittenbogaard, one is to add some protection to your program (3), and (4) splits the screen into two sections, the top half staying unchanged but the lower half scrolling up. Great for adventure game writers.

Your program goes from line 20 onwards and all you have to do is use the command PRINT FN p$("Text goes in the string") with a maximum of 32 characters at a time

LISTING 3

```
  5 CLEAR 60898  FOR f=60899 TO
 60970  READ a  POKE f,a  NEXT f
  10 DATA 205,124,0,59,59,225,1,
15,0,9,235,42,61,92,115,35,114,2
01,11B,205,142,2,123,254,255,32,
248,58,56,92,254,12,40,10,254,18
 40,6,254,20,40,2,24,25,60,50,12
9,92,253,54,0,255,33,0,0,34,66,9
2,33,0,0,34,68,92,59,59,195,125,
27,195,3,19
  15 REM initialise with
         RANDOMIZE USR 60899
```

LISTING 4

```
  5 CLEAR 59999  FOR f=60000 TO
 60081  READ a  POKE f,a  NEXT f
  10 DATA 33,0,72,205,141,234,33
,224,72,22,6,30,32,1,32,7,9,126,
1,224,246,9,119,35,29,123,179,32
,240,1,224,0,9,21,122,176,32,229
,33,0,60,205,141,234,201
  11 DATA 22,8,30,224,1,32,0,9,1
26,1,224,255,9,119,35,29,123,179
,32,240,1,32,0,54,0,35,11,120,17
7,32,240,21,122,178,32,222,201
  15 DEF FN p$(a$)=(STR$ USR 600
00)( TO 0)+CHR$ 22+CHR$ 21+CHR$
0+a$
```

LISTING 1

```
  10 LET MC=60000
  20 RESTORE   FOR F=MC TO MC+54
  READ A  POKE F,A  NEXT F
  30 DATA 62,3,205,1,22,1,0,0,81
,122,254,0,40,+6,62,32,215,21,24
,-11,42,132,92,9,197,17,246,255
  40 DATA 6,8,126,18,197,1,0,1,3
193,19,16,  11,62,164,215,193,3,
121,254,32,32,-31,62,13,215,201

  90 REM general program
 100 INPUT "STARTING ROW?",R1  I
F R1<0 OR R1>21 THEN GO TO 100
 110 INPUT "FINISHING ROW?",R2
IF R2<R1 OR R2>21 THEN GO TO 110
 120 INPUT "STARTING COLUMN?",C1
  IF C1<0 OR C1>31 THEN GO TO 12
0
 130 INPUT "FINISHING COLUMN?",C
2  IF C2<C1 OR C2>31 THEN GO TO
130
 140 POKE MC+6,C1  POKE MC+46,(C
2+1)
 150 FOR F=R1 TO R2  PRINT AT F,
0;  LET L=USR MC  NEXT F
```

LISTING 2

```
  10 LET x=0  LET y=0
  20 INPUT "Type a word in pleas
e",a$
  30 IF LEN a$>10 THEN GO TO 20
  40 PRINT AT 0,0,a$
  50 FOR s=0 TO LEN a$+8
  60 FOR t=175 TO 108 STEP -1
  70 IF POINT (s,t)-1 THEN GO SU
B 105
  80 LET y=y+5  NEXT t  LET y=0
LET x=x+3  NEXT s
 100 STOP
 105 PLOT 0,75  DRAW 255,0
 110 PLOT x,75+(y-3)  DRAW 0,3
 120 PLOT x,75+y  DRAW 3,0
 130 PLOT x+3,75+y  DRAW 0,-3
 140 PLOT x+3,75+(y-3)  DRAW -3,
0
 150 CIRCLE x+1,80-(y+3),2
 160 RETURN
```

LISTING 5

```
 10 LET A=USR "P"
 20 FOR J=0 TO 31  READ N  POKE
A+J, N  NEXT J
 30 DATA 6,255,197,6,75,62,6,21
1,254,16,252,193,16,230,201
 40 DATA 33,0,10,43,126,211,254
,6,205,5,32,-3,175,132,200,24,-1
4
```

LISTING 6

```
 10 PRINT "HOW MANY SELECTIONS
?",
 15 INPUT NS
 10 PRINT NS
 20 PRINT "HOW MANY GAMES ?",
 22 INPUT NG
 25 PRINT NG
 30 DIM N(NG)
 40 FOR I=1 TO NS
 50 LET K=INT (RND*NG)+1
 60 IF N(K)<>0 THEN GOTO 50
 70 LET N(K)=K
 80 NEXT I
 92 STOP
100 PRINT "NUMBERS"
1000 FOR I=1 TO NG
1010 IF N(I)<>0 THEN PRINT N(I)
1020 NEXT I
1030 COPY
1040 STOP
```

Program Protection 2

Tony Porritt offers the system they use in Cleveland for protecting their listings. At this rate ZXC readers will have the most secure programs in the world. Remember to only add line one after your program has been tested and is bug free else you're stuck. LISTING 7

LISTING 7

```
   1 LET L=USR "a"-768  POKE 236
00,L-256*INT (L/256)  POKE 2360"
 INT (L/256)-1  DATA 15,30,12,1,
6 31
   2 REM program starts here
```

3D Window & Text

Two from Alec Goodyear, the first to draw a 3D window on the screen, as written you have to enter the positions, but these dimensions could be built into a program, and the second to allows text to be input to a specified position and length. Again the parameters could be built into a program if desired.

LISTING 8

```
 10 REM 3D Window
 20 INPUT "ROW   ",R
 30 INPUT "COLUMN  ",C
 40 INPUT "HEIGHT  " H
 50 INPUT "WIDTH  " W
 60 INPUT "COLOUR   " F
 100 LET A$=""
                 '
 110 FOR N=R TO R+H-1
 120 PRINT AT N,C, PAPER F,A$[1
TO W)
 130 NEXT N
 140 LET N=(22-R)*6
 150 LET C=C*8 1
 160 LET H=H*8+1
 170 LET W=W*6+1
 180 PLOT C,R  DRAW W,0  DRAW 0
-H  DRAW -W,0  DRAW 0 H
 190 FOR N=R-H-1 TO R-H-3 STEP -
1
 200 PLOT C+3,R  DRAW W,0
 210 NEXT N
 220 FOR N=C+W+1 TO C+W+3
 230 PLOT N,R 3  DRAW 0 -H
 240 NEXT N
```

LISTING 9

```
 40 INPUT "ROW   ",R
 50 INPUT "COLUMN  " C
 60 INPUT "MAX NUMBER OF CHARS
 ",N
 70 PAUSE 50
100 LET I$=""  LET A=0  LET B=0
110 PRINT AT R C
120 IF B=50 THEN LET B=0
130 LET B=B+1
140 IF B<26 THEN PRINT "_",  GO
TO 160
150 PRINT " ",
160 PRINT CHR$ B,
170 LET K$=INKEY$  IF K$="" THE
N GO TO 120
175 PAUSE 70
180 LET K=CODE K$
190 IF K<32 OR K>127 THEN GO TO
220
200 IF A=N THEN GO TO 120
210 PRINT K$,  LET A=A+1  LET I
$=I$+K$
220 IF K<>12 THEN GO TO 250
230 IF A=0 THEN GO TO 120
240 PRINT CHR$ 8," ",CHR$ B,CH
R$ B,  LET A=A-1  LET I$=I$(1 TO
 A)
250 IF K<>13 THEN GO TO 120
260 PRINT " "
300 PRINT AT 21,0 "THE STRING W
AS  ",I$
```

Topsy Turvey

This routine is an interesting means of turning the display upside down, the code is loaded to 32000 but it is relocatable and can be placed anywhere you wish. Use it by RANDOMIZE USR address. This one came from the IOW and was written by David Hiscock. LISTING 10

LISTING 10

```
 10 RESTORE  LET t=0
 20 FOR i=0 TO 117  READ a  POK
E 32000+i a  LET t=t+a  NEXT i
 30 IF t<>10785 THEN PRINT "ERR
OR IN DATA!"
 40 DATA 17,0 88,33 160 90,6,11
,14 32,197,26 79 126 18,113,193,
19 35,13,32 244,197,1 64,0
 50 DATA 167,237,66 193,16,232,
17,0 64,33,160,87 6,6,14 3 197,6
 6,197 5 32,26,79 126,18,113
 60 DATA 19,35 16 247,229 235 1
 224 0,9,235,225 1 32 1,167 237
66,193 16,227 229,235,1
 70 DATA 224,7 167,237,66 235,2
25,5,193,16 210 13 121,254,2,32,
10,17,192,64,33,224,79,6 2,24
 80 DATA 194,254,1,121,192,17,0
,72,33,160,79,6,3,24,180
```

N:E:X:O:R

The Andromedons (alien flavour of the month) have been tinkering with an awesome doomsday machine. Your interstellar DIY mission is to put it back together.

NEXOR
Design Design
£7.95

They're at it again — it seems that you can't go near a computer game these days without being beseiged by hordes of aliens who are just falling over themselves to invade earth and sample the delights of Miami Vice, Stephen King novels and Chinese take aways.

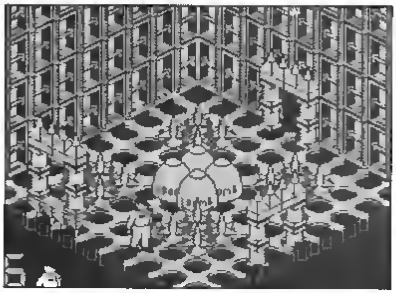
This time it's the Andromedans' turn to have a crack at us, but fortunately Our Boys have been eating their Shredded Wheat and have pushed the Andromedans back to their last stronghold in Orion. All it needed was the completion of the Nemisis weapon to knock out that last stronghold, but then the enemy launched a desperate attack on the NEXOR complex where the weapon was being developed and only your have survived to keep Nemisis out of their hands. Scattered throughout the multi-levelled complex are two sets of five modules, only one set needs to be collected to complete the weapon (the others will be destroyed when the complex self destructs), then if you can find the blueprints and repair the transporter beam you'll be able to keep the weapon out of enemy hands.

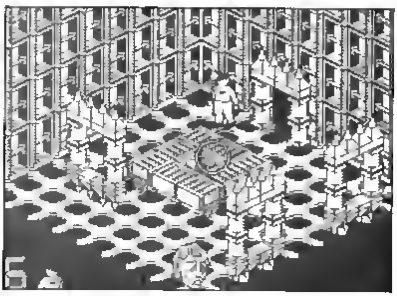
The NEXOR complex might look a little familiar, since it's drawn in the style of two-coloured 3D grapics that have become more or less standard for arcade adventures ever since Knight Lore arrived to harry the nation's joysticks. All the usual paraphernalia is here — moving walkways, deadly spikey things, tables and blocks that have to be moved around to allow you to reach inaccessible exits, and an assortment of robot sprites who sneakily don't appear until the second time you pass through a room so that they can take you by surprise.

You control the figure of the head of security as he attempts to locate the Nemesis modules and repair the transporter beam. You're unarmed so the only way to avoid fatal collisions is by some smart movements using the usual back/forwards, left/right and jump controls. Modules are collected automatically as soon as you touch them, and as you collect each one you are told how long is left before the whole place self-destructs.

The presentation and graphics are all well up to the sort of standard that people expect from Spectrum games these days, but I couldn't help thinking that NEXOR lacked a bit in gameplay. In these sort of games, half the fun lies in the exploration and discovery of all those fiendish obstacles that lie between you and the objects you need to collect, and working out how to get past them. But in Nexor much of the exploration simply isn't very interesting, and finding the modules just becomes a matter of wandering around for long enough. Many of the rooms are full of bombs and other features, yet present no other challenge than walking in and then straight out again because the path through the room is totally obvious. There are a few rooms with some tricky puzzles in, but these are in the minority. Apart from the modules you can only carry one object at a time, and most of these can only be used in the room where you found them (you can't carry them from room to room), so there's no element of judgement involved in deciding which objects to take with you or to leave behind.

Although the programming of NEXOR is well up to scratch the design of the game is rather unimaginative. It's no use filling a room full of nicely drawn objects if none of them do anything. NEXOR has adopted the style of gmes like Knight Lore and Alien 8, but with little of the substance that made them so addictive.





5 FUN FILLED GAMES

NOW GAMES

Virgin Games presents the third fantastic compilation in the **NOW GAMES** series — 5 best selling full price games on one tape for the price of one full price new one!

NOW GAMES 3 is a wide choice of high quality games the whole family can enjoy. Available for **COMMODORE 64, SPECTRUM 48** and **AMSTRAD CPC**

NICK FALDO PLAYS THE OPEN

Mind Games

This beautifully presented simulation features 900 scrolling screens of authentic action over the 18 holes of the Royal St George's course in Sandwich

SORCERY

Virgin Games

This beautifully designed arcade adventure features great graphics and gameplay as it transports you to a land where evil must be defeated and the power of good restored

CODE NAME MAT II

Domark

You are the Captain of Centurion II in this exciting shoot-em up. Your ship has a range of weapons, shields and a tracking system but you must decide the best strategy to eliminate the attacking Myon craft

EVERYONE'S A WALLY

Mike Gee

This is a multi-screened arcade adventure featuring excellent cartoon graphics and lots of humour. Use your ingenuity to get the gang working and uncover the combination to keep wages safe

VIEW TO A KILL

Domark

[illegible] screen arcade adventure based on the James Bond film. Travel [illegible] the Eiffel Tower, a rescue from a flaming City Hotel and [illegible] code breaking at Silicon Valley

[illegible] out for **NOW GAMES** and **NOW GAMES 2**, still the best [illegible] for **COMMODORE** and **SPECTRUM**.

NOW GAMES 3 is available from all good software stores or if you have difficulty, directly from Virgin Games.

Please make your cheque or postal order payable to Virgin Games Ltd. Please do not post cash.

NOW GAMES 3 is £9.95, please tick the version you require ☐ COMMODORE ☐ SPECTRUM ☐ AMSTRAD

NOW GAMES 2 is £8.95 (features Air Wall, Chuckie Egg, Tir Na Nog, Cauldron, World Cup) ☐ COMMODORE ☐ SPECTRUM

NOW GAMES is £8.95 (features Lords of Midnight, Brian Bloodaxe, Strangeloop, Pyjamarama, Arabian Nights, Falcon Patrol II) ☐ COMMODORE ☐ SPECTRUM.

Name _____

Address _____

Virgin Games Ltd 2/4 Vernon Yard, Portobello Road, London W11 2DX

DAN DARE
PILOT OF THE FUTURE

Dan and the Mekan are back! Dan Dare takes to the skies in the new biggie from Virgin.

Dan Dare
Virgin Games
£9.95

By permission of IPC Magazine Youth Group

It didn't take Virgin quite as long to get Dan Dare off the ground as it's taken Ocean with Knight Rider, and now that the game is here it seems that, just for once, the wait was worthwhile. In fact, Dan Dare bears some resemblance to another Ocean game in that it's like a simpler version of 'V'. That's not necessarily a criticism since although 'V' was quite impressive I found that game a bit too fiddly to be addictive.

Dan Dare, on the other hand, does away with the complicated icons of 'V' and concentrates on shoot-em-up action, with just a touch of platform hopping and object collecting thrown in as well.

The plot is explained by a small comic strip that comes packaged with the game. It all starts when a futuristic Eamonn Andrews jumps and tells Dan — 'This is your life'. At which point none other than the Mekon himself makes a comeback and takes over the broadcast, warning all the television viewers in the Solar System of his latest fiendish plot. Heading towards the Earth under Mekon's control is a hollowed out asteroid large enough to destroy the entire plant upon collision. Inside the asteroid is a self-destruct mechanism that can be activated in order to prevent the collision, but the Mekon will only destroy it if he is declared absolute Ruler of The Universe.

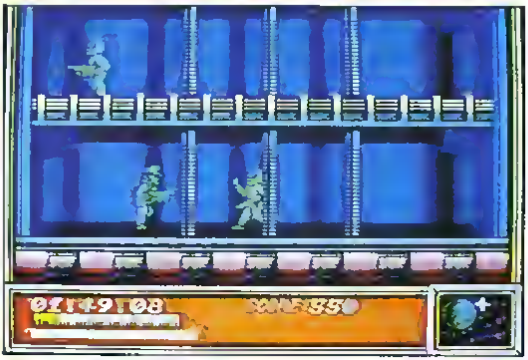
Of course it goes without saying that having old green bonce as ruler of the universe is a prospect too horrifying to contemplate, so the Earth authorities have no choice but to refuse his demands. But how to save Earth?

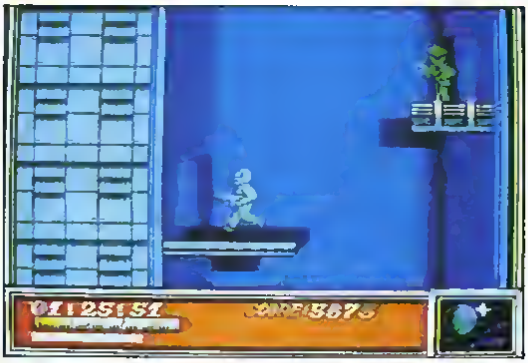
Dan's Jaw

Back in the television studio Dan's jaw sets firmly, his upper lip goes thrusting skywards and Digby (the ever faithful, but utterly useless sidekick) heads for the nearest McDonalds, prior to getting Dan's ship, The Anastasia, ready for take-off.

Within minutes Dan and Digby are on course for the asteroid, ready to take on the Mekon and his followers, the Treens, and save the Earth — just like the good old days.

Inside, the hollowed out asteroid contains five sectors full of armed Treens, corridors, ledges and grav shafts (lifts, connecting different floors). In each of the five sectors there is one control element for the self destruct mechanism, and only when you've collected the element in each sector can you gain entrance to the next sector





(assuming that you've managed to find the relevant locked door)

The screen display shows two floors at a time, so you can often see the Treens descending from above or an object that you might want to collect, and this adds to the atmosphere of the game as it makes the action seem that much busier when you can see other things going on around Dan.

You've got just two hours to complete your mission, and although Dan can't be killed, the Treens can shoot at him and drain his energy which results in Dan being captured and carried off to the cell in that sector. Escape from the cells is no problem but it does result in the loss of ten minutes and much of the skill of the game lies in how good you can get at fighting the Treens as the loss of time is likely to be your major obstacle in completing the game.

The laser that Dan is armed with isn't 100% accurate, and your supply of ammunition is limited so you have to learn when to stand to fight and when to turn that jaw in the other direction and run away, hopefully to pick off the Treens on some other screen.

The action here is similar to that in the Commando type of game, with Dan and his laser faced with hordes of alien soldiers, but the animation is unusually good and the element of uncertainty in using your laser adds to the excitement of the game. And, since getting shot too many times cuts into your time rather than simply killing you, combat becomes a matter of judgement instead of just endless rounds of kill or be killed. As I mentioned earlier there are times when running away is the wiser course.

Inside the asteroid

The five sectors of the asteroid add up to quite a lot of corridors, and it's probably a good idea to make some sort of rough map as you go along in order to remember some of the important locations. Each time you find one of the control elements these have to be returned to the control room in sector 1. That's my only doubt about the game, since you have to go through the sectors in a fixed order and return to the control room each time you might eventually get a bit bored with retracing the same routes by the time you get into the final couple of sectors. Of course the system of corridors is sufficiently complex to allow you to vary your routes but I found it quicker to get around and easier to remember my way, if I stuck to roughly the same routes each time.

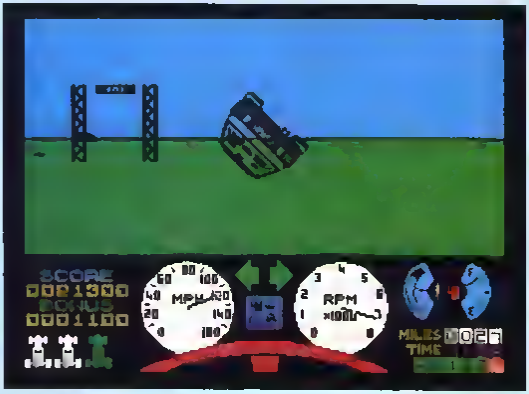
Still, that doesn't make Dan Dare any less enjoyable especially as the main challenge is to improve your combat skill and speed in completing the mission, not simply finding the correct route through the corridors. And the game is very well presented with one nice touch being the way that the screen is presented like a frame from a comic strip, with captions and messages from the Mekon flashing on screen every now and then in the same way that dialogue accompanies the illustrations in a comic.

Because of the delay in getting the game ready, and the speed at which software is improving these days, Dan Dare isn't quite as impressive as it might have been had it appeared last year when it was originally planned, but even so it's still a highly enjoyable and playable game and might even be the best game yet from Virgin.

NIGHTMARE RALLY

A top notch rally game from Ocean with detours into other dimensions.

Nightmare Rally
Ocean
£7.95



This rally is far more than a straightforward dash from A to B over difficult terrain. Strange effects have been built into the route which transforms it into a trip through the Twilight Zone.

Not only do you have to complete each stage within a set time limit you must also amass bonus points to progress and to do this you get involved in some very strange manoeuvres indeed.

The landmarks dotted over the landscape include marker flags indicating the course and fuel dumps which give you an instant tank up. It's important to go round the flags the right side as indicated on the dashboard layout below the main screen and refuelling is essential for you to reach the finishing gate on the first stage.

That's the basic set up but there are many surprises in store. Reckless driving is in fact encouraged — make for the hills, jump over them and you get bonus points and if you hit them at an angle the car does an impressive somersault and you get even more points.

But if you want to sample the more bizarre side of the rally head for the magical standing stones. Ramming these head on produces a strange range of effects. Sometimes you will just stop dead but particular stones will variously cause your car to take to the air, reverse the screen so you are driving with the sky above you or create a curious blurring effect on the landscape.

All these effects are graphically so convincing that you immediately accept them as a part of the game. The perspective shifts are also very smooth giving a real sensation of speed. Searching out all the screen effects can distract you from reaching your objective but it's worth expending a few lives just to test them out and after a few outings you discover that they can actually help you. Flying over trees and obelisks, for instance, brings in some valuable bonus points. On some stages, diversions from the main course are essential to collect the necessary bonus points.

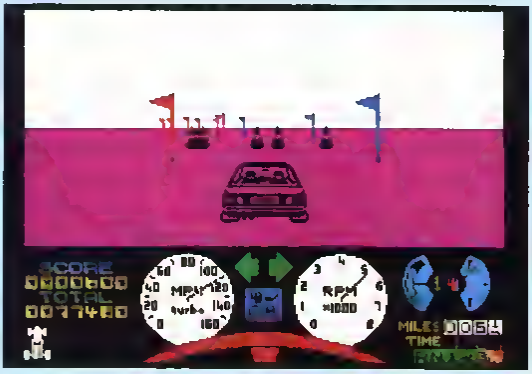
Sometimes the weather conditions alter and fog descends cutting visibility down completely so that objects seem to appear out of nowhere. Each stage presents different challenges.

The first is a flat plain strewn with objects to collide with for a bonus point accumulation and others to strictly avoid. Only experience will tell you which is which.

The second stage is completely different being a winding course over an icy surface. Choosing the correct speed is important here but you'll find that even successfully getting through the flag gates is not enough to get you to the next stage. Also on the course are numerous cones which you must clip to get you the required points tally.

Nightmare Rally is an excellent game for anyone who likes being behind the wheel of a computer simulation. Very challenging, very unpredictable, this game is highly addictive and highly recommended.

GREAT



AVOID THE MONSTER RUSH FOR

ZX MONTHLY COMPUTING

SUBSCRIPTION RATES

£15.00 for 12 issues U.K.
£18 00 for 12 issues Overseas Surface Mail
£61.20 for 12 issues Overseas Airmail

Please begin my subscription(s) to ZX COMPUTING MONTHLY with the issue

I enclose my cheque/postal order for £ made payable to Argus Specialist Publications Ltd *or* debit £ from my Access/Barclaycard No

valid from

to

NAME (Mr/Mrs/Miss)

ADDRESS

Postcode

Signature

Date

Please use BLOCK CAPITALS and include post codes

Send this form with your remittance to
INFOVET LTD Times House, 179 The Marlowes Hemel Hempstead, Herts. HP1 1BB

SPECTRUM EXTEND

Interface One owners can add some new commands to Sinclair Basic, with this program.

By Paul Matthews

Any Spectrum user with Interface 1 will know that it allows the use of microdrives, RS232 devices, and the ZX net. However, a less well known feature is the facility to extend Spectrum BASIC by changing the syntax of certain keywords. This feature is used by my routine to provide the Spectrum user with six extra commands. They are —

PLOT *x,y which will PLOT anywhere on the screen. Co-ordinates (00) are in the very bottom left hand corner, where it is not usually possible to PLOT. So the normal PLOT 00 becomes PLOT *016 and PLOT 0,175 becomes PLOT *0,191

POKE *a,b where b is a number from 0-65535. This means that a 16-bit number can be POKEd with the low order byte going into location a and the high order byte going into the location (a+1), i.e. POKE *23735, 64900 is equivalent to POKE *23735, 132 and POKE 23736, 253.

**POKE AT a, a$** which will POKE a hexadecimal value held in a$ into location a. eg. POKE AT 23296, "C9" will put C9 (201 dec) into location 23296. If there is more than one hexadecimal number (which can be separated by spaces) then they are put into the locations following a. eg. POKE AT 23296, "3EFEC9" and POKE AT 23296, "3E FE C9" are both possible and will POKE 3E (62 dec) into location 23296, FE (254) into 23297 and C9 (201) into 23298. Therefore, this command could be used to enter machine-code easily and quickly.

ATTR f,p,i TO nf,np,ni which will search out specified attributes and replace part or all of each found, with a new attribute. f is the flash and brightness intensities to be changed (0=none, 1=bright only, 2=flash only, 3=both, 5=any combination). p and i are the PAPER and INK colours to be changed (0-7=Black-White, 8=all colours). nf is the new flash and brightness intensities (0=neither, 1=bright, 2=flash, 3=both, 8=leave as they are). Finally np and ni are the new PAPER and INK colours (0-7=Black-White, 8=leave as it is, 9=contrast).

ATTR 1,0,6 TO 1,7,1 will change all characters which are bright yellow INK on black PAPER to bright blue INK on white PAPER.

ATTR 8 8 0 TO 1,8,9 will change all characters with black INK (no matter the PAPER colour and flash or brightness intensities) to bright contrast INK (either black or white) on the original PAPER colour. Note, one of the powerful features of this command is that the whole screen can be changed by setting the first three numbers to '8'. eg. ATTR 8 8 8 TO 8,1,8 will change the entire screen to blue PAPER.

INVERSE which swops over the PAPER and INK colours in the attribute file without altering the flash and brightness intensities.

SIN which stands for 'Screen INvert' and will invert all the characters on the screen.

NOTE: INVERSE and SIN have the same visual effect but INVERSE affects ATTR (as bits 0,1 & 2 and bits 3,4 & 5 of each attribute are swopped over) but does not affect POINT whilst SIN affects POINT (as all pixels set are reset and vice-versa) but not ATTR.

New Vector

The key to extending the BASIC is the "new" system variable VECTOR. Whenever a syntax error occurs, the "shadow" ROM (i.e. that in Interface 1) is paged in and checks the syntax to see if it's one of the Micro-drive commands, if not, it jumps to the

ED BASIC

location pointed to by VECTOR Therefore, to add commands you need only change VECTOR to point to the beginning of your own machine code routine This is done in the set-up routine (lines 210 - 240 of the assembly listing Lines 210 - 20 set up the "new" system variables, as these are not usually set up until an error occurs) Before you can use the extra commands the set-up routine must be called by a line such as LET a = USR 64900 (64900 is where I placed the routine in memory However, if you assemble it, you can put it anywhere you want by changing Lines 10 and 20 Once assembled, though, the routine cannot be moved

When a non standard command is found, the routine will be called However, the "shadow" ROM will be paged in which means that if you want to use of any of the "main" ROM routines you cannot use call as that would CALL a "shadow" routine. Instead you have to use an RST # 0010 instruction (#denotes hex) followed by the address of the 'main' routine. This 'shadow" routine pages in the "main" ROM, calls the required "main' routine and then pages out the "main" ROM in this article, the restart routine has been given the name CALBAS On entry to the routine pointed to by VECTOR another system variable CH ADD will be pointing to the command of the error statement To find out what command this is, the "main" routine GET CHAR (#0018) is used This puts the character pointed to by CH-ADD into the A register The next characters in the statement can then be found by using NEXT CHAR (#0020) which increases CH-ADD by one and puts the character now pointed to, into the A register

Keywords

I have used five different keywords and, as you can see, they do not all have to be common commands eg ATTR (a function) is being used Also note that if the syntax of your new command is the same as that of the original (eg PLOT and POKE in this article) another character (eg an asterisk) has to be placed after the keyword or the ROM will not recognise it However, if you do not like the present keywords, you can make your own up eg *Renum or *Delete, but these have to be typed out in full and each letter must be checked by increasing CH-ADD and then comparing the character The asterisk, which could be any shifted symbol, is necessary to get the cursor out of K mode.

It can be seen (in lines 270 - 380) that the first thing to be done, once called by the ROM, is to get the code of the error command into A, and then check this against the five new commands (not six, POKE is used twice) If one of these commands is found the appropriate routine is called, otherwise the normal error routine (#01F0) is called instead, which produces either a flashing question mark or 'nonsense in BASIC'

Interesting points to note in my routine include the fact that POKE is used twice. This is done by jumping to the second routine when the asterisk after the POKE fails. Only if the character also fails to be an "AT" sign is the error routine called Another thing to be noted is that the ATTR scanning routine (i.e. when it actually looks at the screen) is really only four lines in length However this is increased by also allowing ATTR to have new INK and PAPER colours 9 which cannot be easily changed in the same way

I hope my routine provides useful commands and that this article will help you to write your own commands. For further information, I advise you get Ian Logan's "Spectrum Microdrive Book", and "The Complete Spectrum ROM Disassembly' by Ian Hogan and Frank O'Hara

SPECTRUM EXTENDED BASIC

Listing 1

Machine code loader

```
1 REM  Six Extra Commands
       by Paul Matthews
10 CLEAR PEEK 23732+256*PEEK 2
3733-436: LET p=PEEK 23730+256*P
EEK 23731+1: LET a=23-PEEK 23730
)
20 CLS #: PRINT TAB 3; FLASH 1;
"Loading ^& Commands" Date '''
30 FOR i=p TO p+439 STEP 20: L
ET l=0: FOR q=0 TO 19
40 READ a: LET l=l+a: POKE i+q
,a: NEXT q
50 READ a: IF a<>l THEN PRINT
"Error in Data Between Addresses
a";i" and";i+19: BEEP .1,0: BE
EP .1,12: BEEP .1,0: STOP
60 NEXT i: PRINT TAB 5;"Data E
ntered Correctly": BEEP .1,12: B
EEP .1,15: BEEP .1,20: BEEP .1,1
5
70 PRINT '''''Tem Routine will
now be saved ''''To re-load the
 routine at any  time, enter th
e following ''''CLEAR ";p-1";"LO
AD ''''CODE ";p;",448''''LET a=US
R ";p
80 SAVE "& Commands"CODE p,448
90 REM or to Microdrive with
SAVE *"m";1;"& Commands"CODE p,
448
92 PRINT '''''To use the Extra
Commands now,  you need only ent
er the last of the above stateme
nts "
95 REM Address 44984
100 DATA 207,49,33,141,233-a,34
,183,92,201,215,24,8,234,246,202
,189,233-a,234,244,202,3276-a-a
110 DATA 225,253-a,234,171,223,
122,234-a,234,221,202,84,234-a,2
54,178,194,208,1,219,22,9,3618-[
w53]
120 DATA 203,183,5,33,8,64,120,
47,119,35,124,254,88,32,247,24,3
3,215,32,8,1066
130 DATA 254,48,32,43,215,121,2
8,203,183,5,215,148,38,245,215,1
48,38,193,79,62,2493
140 DATA 191,144,56,96,215,174,
34,215,234,34,193,175,8,215,32,8
,254,172,32,83,3578
145 REM Address 45000:
150 DATA 215,128,28,234,44,40,2
,231,8,215,32,8,215,140,28,203,1
95,5,215,241,2421
160 DATA 43,197,213,215,183,38,
197,225,209,193,128,234,8,32,7,1
77,254,1,40,221,2983
170 DATA 56,209,26,254,32,40,19
,203,46,254-a,7,7,7,7,11,197,79,
19,26,205,1781-a
180 DATA 46,254-a,177,193,119,3
5,19,11,24,216,214,40,254,16,216
,214,7,254,16,216,2543-a
190 DATA 215,249,56,254,42,32,1
76,215,121,28,203,183,5,215,153,
58,197,215,153,58,2754
195 REM Address 45188:
200 DATA 197,225,193,113,35,112
,24,128,215,32,8,203,183,5,33,8,
88,126,238,192,2346
210 DATA 87,126,15,15,15,234,7,178,119,
35,126,254,193
```

Listing 2

Demo of the new commands.

```
1 REM ************************
      &Demo Program, type in&
      &machine code first ' &
      ************************
5 CLEAR 44899: LOAD "& Comman
de"CODE
10 LET a=USR 44234: GO TO 9000
15 REM Change values in lines
9 and 10 for use in 16K
20 RESTORE
30 FOR i=0 TO 7: FOR q=0 TO 7
40 PRINT AT i*2,q*4; INK 4; PA
PER 9;"i FLASH 1;"j BRIGHT 1
;"i FLASH 0;"
50 PRINT AT i*2+1,q*4; PAPER 4
; INK 9;"i FLASH 1;"j BRIGHT
1;"i FLASH 0;"
60 NEXT q
70 READ d$: PRINT  INK 8; PAPE
R 9; FLASH 0; BRIGHT 0;AT 4*2,8;
"INK"+d$+"AT 4*2+1,8;"PAPER"+d$
80 NEXT i
90 PRINT AT 17,0; INK 1;"Set 4
4th Numbers""0=none,1=BR,2=FL
,3=FL+BR,8=all" INK 2;"Others:
0 to 7=Black to White,  8=All. A
lso 9=Contrast for 56kth"
100 INPUT "ATTR ";i1;",";j1;",";i
1;" TO ";i2;",";j2;",";i2
110 IF i1<0 OR p<0 OR i1>8 OR i1<
0 OR p1<0 OR i1<0 THEN  GO TO 10
0
120 IF (i1>3 AND i1<8) OR p1>8 OR
 j1>0 OR i2>3 AND i2<8) OR p2>9
OR i2>7 THEN  GO TO 100
130 FOR q=0 TO 31: PRINT AT 21,
q; INK i-(INT (RND*40) MOD i-8);
BRIGHT INT (RND*2); FLASH INT (R
ND*2); PAPER 8 (INT (RND*8) AND
p=8);"k": NEXT q
180 PRINT #1;AT 0,0; INK 3;"Pre
ss any key to demonstrate"'AT 1
,0; INK 8;"ATTR ";i1;",";j1
INK 2;p;",";i2;"  TO ";i2;",
";j2; INK 2;p;",";i1: PAUSE 0
200PRINT 4,p,1 TO 4;p,1;1
250 POKE AT 23296,"0001 C0000E
C9": REM LD B,4: CALL 0C00 RET
280 LET a=USR 23296: PRINT #1;A
T 1,0; INK 9;"Press any Keyexce
pt ^/^/to Cont"
300 PAUSE 0: BEEP .1,10: BEEP .
1,15: BEEP .1,20: BEEP  1,12: IF
 PEEK 23560<>CODE "i" THEN  GO T
O 30
1000 DATA "Black","Blue","Red","
Magenta","Green","Cyan","Yellow"
,"White"
9000 REM Instructions
9010 CLS ' PRINT  INK 3;AT 0,4;"
Six Extra Commands"AT 1,7;"by P
aul Matthews"
9020 PRINT AT 3,0;"This 448 Byte
 routine gives the user ten foll
owing new Commands"
9030 INK 1: PRINT AT 4,0;"PLOT 8
x,y "; INK 2;"which can PLOT eve
n onthe bottom two lines "
9040 PRINT AT 9,0;"POKE @addr,nu
m "; INK 2;"which will POKE eight
-bit number into an address."
9250 PRINT AT 12,0;"POKE AT addr
,hs "; INK 2;"which will POKE ad
dr with hex held in the string"
9060 PRINT AT 15,0;"ATTR i,p,i T
O i+7,p,i"; INK 2;"which  se
eks out attributes and changespa
rt or all of each found."
9070 PRINT AT 19,0;"SIN "; INK 2
;"i e  ^Screen Invert^"
9080 PRINT AT 20,0; INK 0;"and";
 INK 1;AT 21,0;"INVERSE "; INK 2
;"i e  ^Attribute Inverse^"
9090 PRINT #1; INK 3;"Press any
key for Renumbering"
9100 PAUSE 0:  INPUT ""
9110 FOR i=0 TO 1: LET a=USR 23
296: NEXT i
9130 INK 8:  PRINT AT 11,0;"BIN e
xecute the POINT command search
pixel changes its state" "e.g. P
OINT (8,0) = ";POINT (8,0)
9140 PRINT #1; INK 3;" Press any
 key for Demo of BIN"'"Pause 0"
INPUT ""
9150BIN ' PRINT AT 14,0;"and now
 POINT (8,0) = ";POINT (8,0)
9160 PAUSE 50: PRINT AT 16,0;"IN
VERSE e4execute ATTR as  AT INK an
d PAPER colours are swapped  e.
g. ATTR (8,8) = ";ATTR (8,8)
9170 PRINT #1; BEEN 1; INK 3;" P
ress any key for INVERSE Demo "
 PAUSE 0: INPUT ""
9180 INVERSE ' PRINT AT 19,0;"an
d now ATTR (8,8) = ";ATTR (8,8)'
'but at;1 POINT (8,8) = ";POIN
T (8,8);1;"
9190 PRINT #1; INK 3;AT 0,0;" P
ress any key for ATTR Demo  (N
ote:To stop demo press "^"^)  "
9200 PAUSE 0: CLS ' GO TO 20
9999 SAVE *"m"+"Demo" LINE 1
```

·DEACTIVATORS·

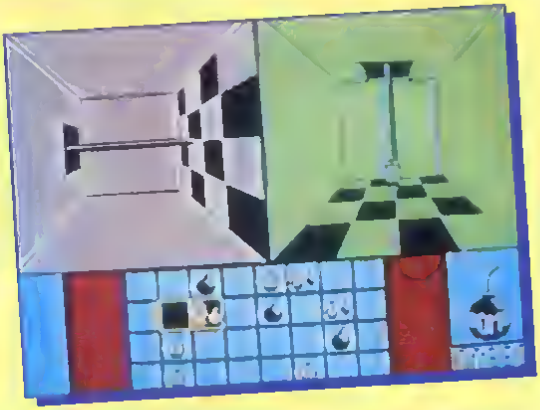
Deactivators
Ariolasoft
£8.95

As chief of security at a top secret research centre, you are already in considerable hot water as a group of terrorists have bypassed your security system and planted a series of bombs, timed to detonate in sequence over a short period of time. As if that wasn't enough, they have also reprogrammed the guards to attack everything on sight. Your only hope of regaining some of your lost credibility is to send in a team of deactivating droids and get rid of the bombs as quickly as possible.

The building is on five levels and each one must be cleared in turn. At the bottom of the screen is a map showing the layout of the floor together with the location of your droids and the bombs. A series of icons can be used to select a specific droid and also to view any two adjacent rooms. These are drawn in 3-D perspective and show details of all the exits and objects present.

Clearing the level of bombs is no easy matter and there are several problems confronting the droids. Not the least of these is that they are limited in which rooms they have access to and this results in one droid having to pick up a bomb and throw it through a window into a different sector. It helps if you have another droid there waiting to catch it for there is always the chance that the bomb will detonate prematurely. You will also find circuit boards lying around and the object with these is to return them to the computer room. These are essential as they open up extra windows and doors, activate teleports and remove force fields. Your aim is to find a room at the corner of the building with a window leading to the outside through which you can dispose of the bomb.

On top of all this there are the guards to contend with. They will destroy you on contact and the only way to neutralise them is by persuading them to follow you through a hole in the floor onto the next lower level. Do this often enough and the guards will blow up. Still your problems aren't over. Because of the nature of the research establishment, some of the



rooms have decidedly funny properties. The main difference you will notice is that they are all colour coded and this refers to the gravity level in the room. This ranges from ½G to 3G and affects your aim badly when you try to throw objects out of a room. At higher levels, rooms are rotated through 90 or 180 degrees, giving rise to another set of problems. Or a room may be blacked out totally.

Deactivators is an excellent mixture of strategy and action. It is not easy to work out the correct sequence of events that you must organise and a lot of people will find that they are getting nowhere fast with the game. Certainly it is very daunting at first and it would help considerably if you could get a decent demonstration before deciding if it is the game for you. Love it or hate it, it will definitely give your grey matter a good working over.

GREAT

THE TRAP DOOR

What is the Bad Tempered Thing, how do you boil Slimies, and where does Terry Wogan fit in to all this? The answer's beneath the Trap Door.

The Trap Door
Piranha
£7.95

Not that long ago, Programmer Don Priestley wrote a computer game based on the Popeye comic strip and cartoon series, and for the game he came up with some new techniques that created some of the largest coloured sprites ever seen on the Spectrum, as well as masking techniques that almost made you forget about the Speccy's attribute problems. Unfortunately, the Popeye game didn't set the world alight (though I thought it was excellent), but now Don Priestley and his mega sprites have reappeared at the helm of the first game from the new Piranha label, The Trap Door, based on a new children's series produced by Terry Wogan's own production company, and due to be seen on television this autumn.

Berk and Drut

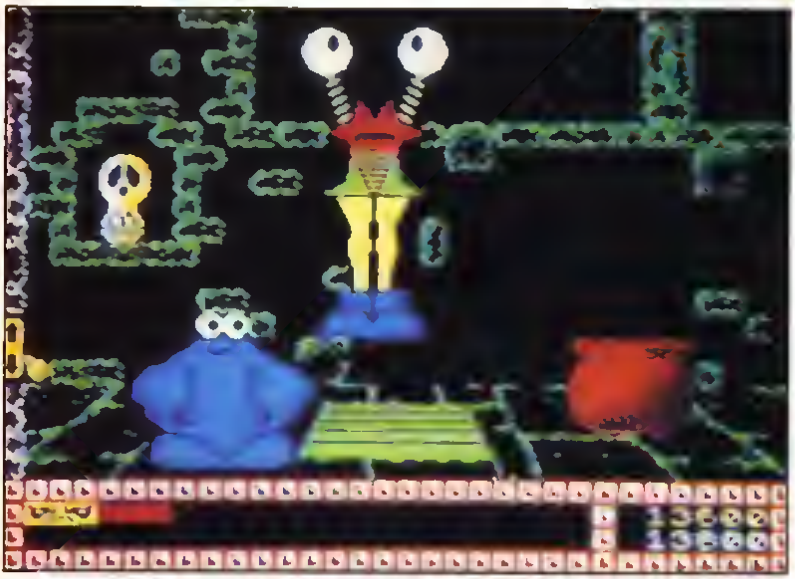
The main character in the series is a blue blob-like fellow by the name of Berk. Berk is the servant of the Bad Tempered Thing who lives in the upper regions of the castle whilst Berk rushes around in the castle cellar doing the Thing's bidding (which normally means getting his meals — worms, boiled slimies, that sort of thing).

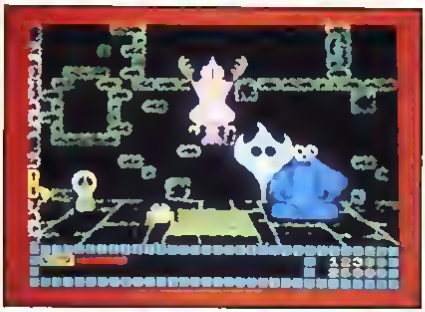
Also tucked away in the cellar is the Trap Door, beneath which lurk all sorts of weird creatures. Some of these things can actually help Berk in his chores, though others are just plain awkward.

In the game, you are in control of Berk and have to complete the tasks that will get shouted down to you from upstairs. This involves looking for, and also making use of the creatures that will pop up from the trap door just about every time you open it. Along the way you'll have to solve some of the most devious and imaginative problems that you're likely to come across in an arcade/adventure. What, for instance, do you do with the bullet if you haven't got a gun and how do you make the bird lay eggs? Fortunately Berk has a friend called Boni, a disembodied skull who can provide the odd bit of advice if you're not sure what to do next.

Down in the dungeon

The playing area down in the cellar isn't all that huge, consisting of barely a dozen screens, but as with the Popeye game, one of the things that makes the game so enjoyable is the 'layered' effect that allows you to move characters and objects not just up/down and left/right in two dimensions, but also into and out of the screen to create a real 3D effect. So,





although the number of individual screens is quite limited, there is a lot more that can be done than in most other games. There are passages and staircases that you can wander through, and a number of objects that need to be positioned carefully in order to complete your tasks.

Sprites

But the main feature of Trap Door is probably the quality of the graphics and animation. Berk himself is a sprite of not inconsiderable proportions, but some of the monsters that pop up out of the trap door are larger than anything that I've ever seen drawn on a Spectrum screen, and yet they move around the screen smoothly and without any attribute problems. The animation is so good that it's fun to just sit and watch all the action in front of you. One of the nice things about the television program is the way that all sorts of little creepy crawlies just wander about doing odd things irrespective of what the main characters are up to, and this has been carried over into the computer game so that you can have Drut (a small yellow blob) chasing worms around the screen while Berk is busy trying to do something else. This adds to the atmosphere of the game and makes it feel almost like a real cartoon world.

Don Priestley's earlier experiments with this type of game haven't been wildly successful, perhaps they fall rather awkwardly between the two types of arcade and adventure game (and also because the animation techniques are so costly in memory that a 48K doesn't really do them justice). But hopefully with the publicity surrounding the TV series people will take a close look at Trap Door and enjoy it as much as I did.

MONSTER HIT

CYRUS·II

Chess fanatics have never had it so good as another strong contender for the Spectrum grandmaster crown enters the arena.

Cyrus II Mark I
Alligata
£11.95

Cyrus II arrives on the Spectrum with a good reputation from its performance on other micros and with the recent release of Psi Chess and Colossus 4 Chess, Spectrum owners are being spoilt for choice.

There will obviously be a lot of debate on which is the strongest program available and Alligata have thrown down the gauntlet with a statement from their managing director included on the inlay which says, "I am confident this game will beat all existing Sinclair Spectrum chess programs published"

No doubt the makers of Colossus 4 Chess will dispute this. Making a comparative assessment of the two programs with any degree of accuracy by playing them off against each other requires an awful lot of time — too much to fall within the parameters of this review. I'm sure both software houses will be letting us know the results soon enough

Leaving aside the issue of which program can beat the rest, it has to be said the Cyrus II is a very strong player and there are all the features included which single it out as an excellent opponent.

There are no 3-D graphics (the Mark 2 version for the 128 will have them) but the screen display is very bright and clear There are nine standard levels of play with thinking time ranging from two seconds to three and a half minutes. In addition there is an adaptable mode (Cyrus adapts to your response time), infinite mode (Cyrus will wait until you decide he can move) and a problem mode (Cyrus will search for a checkmate in five moves or less).

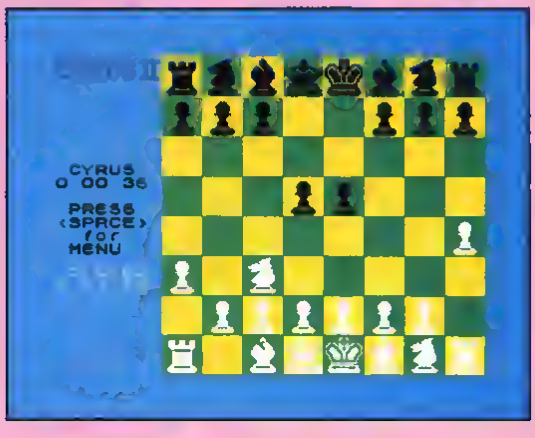
Other features include replaying the game, taking back moves, playing both sides, changing sides, hints from Cyrus and demonstration games. There is also a simple print-out facility, if you want to record game situations for posterity

One big advantage with Cyrus II is that accessing different modes is very simple with most commands being made with a single key entry

Making the moves is also very straight forward by use of cursor keys (there is no joystick option) Simply move the cursor key to your chosen piece, hit enter, then move a second flashing cursor to your chosen square Hit enter again and the move is made.

This program is a very welcome addition to the Spectrum chess scene and is recommended highly the drawback however is the price. At £11 95 it's two quid more expensive than both Psi Chess and Colossus 4 and one wonders why it couldn't have been released at just under a tenner, like its rivals.

Cyrus II is a superb program and still worthy of a Monster Hit at the price but in a sector of the market which is now fiercely competitive it may have spoilt its chances with those who are after just one chess game.



MONITOR

If you're writing your own machine code programs you'll need a good monitor to help debug them — so here it is.

BY JON ELLIS

Over the course of writing many machine code routines I realised that I had no good program for debugging them So, if you haven't got a program – write it yourself Here is that program, a monitor which should provide all the functions you would normally need in the course of debugging a machine code program

Numbers can be entered in either hex or decimal, regardless of the state of the number base toggle Decimal numbers must all be five digits long, being bulked out with leading zeros if necessary To enter a number in hex, type '&' as the first character, and then the number in four hex digits, again using leading zeros if necessary If only one byte is required then the low byte is taken, ie if you enter a number greater than 255 when the Monitor is expecting a number in the range 0 to 255, then your input will be taken as modulo 256

After most functions have been executed the Monitor will pause for you to examine the results of the function, if any To terminate this pause press either 'X' or BREAK and you will then be returned to the menu

The Monitor is written so that you can treat the Spectrum as a Z80 processor only as far as possible This means that, although the Spectrum operating system requires the Iy register to have the value 23610 at all times, unless your routine is going to use the operating system, you may ignore this requirement A similar situation occurs with the hl' pair The registers that are used when your routine is run are not those used by the Monitor or the Spectrum ROM

To abort a function you should press BREAK which will return you to the menu

Monitor Functions

The monitor offers a menu of 18 functions

1) *Alter memory* This function will prompt for a start address (see note on the input of numbers), and the program will then print the address and its contents. The Monitor will then wait for you to input the new value before moving on to the next byte When you have filled up a screen, press 'X' for another page At any time you may press BREAK to escape.
2) *Breakpoint* This function enables you to place an instruction in the middle of the code that is being debugged Which causes execution to be stopped, and control returned to the Monitor so that you can alter/inspect the registers etc. The breakpoint instruction is three bytes long, and thus two breakpoints should not be inserted less than four bytes apart otherwise a crash might occur on execution The code that occupied the three bytes overwritten by the breakpoint instruction is stored, and will be replaced when the breakpoint is deleted When you select this function from the menu it will prompt for the address at which the breakpoint is to be inserted A total of nine breakpoints may be used at once If all nine are in use then nothing will happen when the function is selected
3) *Convert number* This function will prompt for the input of a number and then print the number in decimal, hex, and binary
4) *Delete breakpoint* When selected, this command will display all nine of the breakpoints and then ask for the number of the breakpoint to be deleted (Note that you should enter the number of the breakpoint (1-9) *not* its address) The three bytes that were overwritten will then be replaced
5) *Examine stack* The Monitor provides 40 bytes of stack space solely for use by the object program On entering the Monitor or resetting the registers, the stack is reduced to one word in length, this word being a return address inside the Monitor, which should prevent a crash in the vent of a RET instruction being executed at the end of the object program On selection, this function displays all the words currently on the user stack
6) *Fill memory block* This command allows you to fill a block of memory with a specified value It prompts for a start address, the length of the block to be filled, and the byte to be used
7) *Jump to routine* The function will prompt for the address to be jumped to, and execution will continue from this address using the values of the user registers (see later) This function is to allow for the object code to be tested Ideally a breakpoint should be used at the end of the code to return to the Monitor, in which case the report 'BREAK at (address)' will be displayed However a RET instruction should also work providing that the routine has used the stack correctly
8) *Look at breakpoints* This function displays the addresses of each of the nine breakpoints, an address of 0 indicating that the breakpoint is unused
9) *Move memory block* This command allows you to copy blocks of memory to other areas It prompts for the start address of the block, the start of the destination area, and the length of the block to be copied
10) *Number base toggle* This toggle determines the base in which all numeric output from the monitor will be displayed It toggles between hex, decimal and binary Only some output can be displayed in binary due to the length of binard word (16 characters) other output being displayed in hex The toggle defaults to decimal
11) *One step routine* This is probably one of the most useful functions. It enables you to step through the object code one instruction at a time, whilst keeping track of the user register values. The Monitor will prompt for a start address, and will commence stepping from that address, updating the register display after each instruction and then pausing for you to inspect the registers. To move to the next instruction, press 'X' To escape, press BREAK
12) *Printers toggle* When toggled to ON, this causes output from the View memory function to be dumped to the ZX Printer The toggle defaults to OFF

▶ ▶ ▶

Instructions

The Monitor is written entirely in machine code and occupies the memory from 28350 to 32767, and is thus 4418 bytes long. This means that it will fit on a 16K Spectrum, but it is unlikely that the expansion opportunities offered by the User program feature will be utilised fully.

Type in listing 1 and save it — this is the hex loader. Run the program and you will be prompted for the string of hex digits and then for the check digit. Although the check digit might not look right it is actually more effective than a normal checksum, spotting the vast majority of transposition errors. When you have finished the program will save the finished code and then verify it.

Reset the machine and then type **CLEAR 28349: LOAD "MONITOR"CODE** as a direct command. After the code has loaded you should enter the Monitor with RANDOMIZE USR 28350. A menu of the 18 functions should be displayed. You should test each of the functions carefully. If you discover any errors then listing 3 should help — it displays the code you have entered in the same format as listing 2.

13) *Quit* Returns control to BASIC.

14) *Register display* This function displays the values of the user registers, both the normal and the alternate set. The current values of the interrupt vector register, I, and the memory refresh register, r, are also displayed. The value given for the program counter, pc, refers to the last instruction executed. The value of the stack pointer, sp, that is displayed refers to the user stack. The flags register of the normal af pair is shown expanded into bit format, with each of the six flags labelled. The value of the maskable interrupt flip-flop is also shown, the interrupts being enabled or disabled as appropriate when the user code is executed.

15) *Specify entry values.* This function allows you to change the values of the user registers, perhaps to test a subroutine whose parameters are passed to it in the registers. You can also specify the value of the zero flag and the carry flag. You should select the register to be altered by pressing the appropriate letter. To escape press BREAK.

16) *Use other program.* This function allows you to use another program and to call it from the Monitor. The function is not designed for the execution of the object program, but for the calling of some other utility such as a disassembler. When you quit the other program, control will return to the Monitor. The use of this function to call an assembler forms a very powerful development tool.

17) *View memory.* This displays the contents of memory from the specified start location, dumping also to the printer if the printer toggle is on. The routine displays 110 bytes per page, 20 bytes per page if using binary. When the page is full the computer will wait for you to press 'X' before proceeding to the next page. To escape, press BREAK.

18) *Zero registers.* This function restores the user registers to their original values that they held when the Monitor was first entered. In most cases this is 0, but the iy register defaults to 23610 and the hl' pair defaults to 10072 as required by the Spectrum operating system. The user stack is also reset and preloaded with the return address mentioned earlier in the examine stack function.

Listing 1

Hex loader program

```
 10 REM ***********************
 20 REM **    HEX  LOADER    **
 30 REM ** by Jon Ellis 1985 **
 40 REM ***********************
 50 CLEAR 28349
 60 FOR F=28350 TO 32767 STEP 8
 70 PRINT F;
 80 LET CHECK=0
 90 INPUT "Enter bytes";LINE
$$
 100 IF LEN $$<16 THEN  PRINT "
Error in length": BEEP .2,0: GO
TO 70
 110 PRINT TAB 8;$$;
 120 FOR G=1 TO 8
 130 LET BYTE=16*(CODE $$(1)-48-
(7 AND $$(1)>"9"))+(CODE $$(2)-4
8-17 AND $$(2)>"9")
 140 POKE F+G,BYTE
 150 LET CHECK=CHECK+BYTE*G
 160 LET $$=$$(3 TO )
 170 NEXT G
 180 INPUT "Enter check digit:";
LINE C$
 190 IF LEN C$<>1 THEN  GO TO 18
0
 200 PRINT TAB 27;" ";C$
 210 LET DIGIT=CHECK MOD 10: (CHEC
K/9)
 220 IF DIGIT<>VAL C$ THEN  PRIN
T "Error in string - input again
": BEEP .2, 12: GO TO 70
 230 NEXT F
 240 PRINT  FLASH 1;"READY TAPE
FOR SAVING"
 250 SAVE "MONITOR"CODE 28350,44
18
 260 CLS
 270 PRINT  FLASH 1;"READY TAPE
TO VERIFY"
 280 VERIFY "MONITOR"CODE 28350,
4418
```

Listing 2

Hex data for the machine code.

```
28350  C8D777C0B678D021  ) 8
28358  A87FD0C8B0B6B175  ) 8
28366  B1112B7BCD3C2B06  ) 8
28374  122143581128B036  ) 5
28382  3A191FB5E16D73E  ) 3
28390  B0D73E16D7D3685  ) 3
28398  F2D0C8B0B6282B3E  ) 3
28406  4F0726E6D7180FB  ) 3
28414  365647E4F0736E46  ) 4
28422  B726E6D73E16B73E  ) 8
28430  B0D73E19D73AA47F  ) 5
28438  8E1B2B22FE0228BF  ) 1
28446  F0365B7B3E44D73E  ) 2
28454  45D73E45D181CF0  ) 8
28462  2B5B6B3E42D73E49  ) 2
28470  D73E4ED7180BF036  ) 8
28478  5578CE4B0D73E45D7  ) 5
28486  3E5B27F03653B0CD  ) 8
28494  AD77B1128021227A  ) 4
28502  C9B128FE112274A7  ) 8
28510  ED5228291134741B  ) 5
28518  5E235AEBC07B6FC3  ) 5
28526  C16EE9CB0E7B3E41  ) 8
28534  D7CB94778B22AA7F  ) 8
28542  3E0D07F07E4FFE32  ) 8
28550  2B87CB4B78B0C9B6  ) 6
28558  782AAA7FE52AA37F  ) 6
28566  22A87F3E02BCCCD1  ) 8
28574  71BDCB0BCEE1E5CD  ) 1
28582  1C782AA87F22A37F  ) 3
28590  3E17D73E4D73E2B  ) 7
28598  B7E1E57E2322AA7F  ) 4
28606  6F2608DCB0B0ECD  ) 4
28614  1C783E17B7E14D7  ) 1
28622  3E2B07CD4D78B7E1  ) 3
28630  B87718A43AA27FFE  ) 4
28638  B9DBC0B678D3E4D7  ) 6
28646  CD7579B022AA7F3A  ) 2
28654  A7F3C32A77F3B97  ) 2
28662  B7B3B25F160D21F8  ) 7
28670  7A19EB50AA7F7323  ) 2
28678  72231A773ECB1223  ) 2
28686  131A7B15F777912  ) 2
28694  23131A7779120CD  ) 8
28702  B6783E4307CD8479  ) 1
28710  B022AA7F2AA37FE5  ) 8
28718  B1BE#11457FCB3C  ) 5
28726  2B52AA7F11B58A  ) 1
28734  ED53A37FCB1C78B1  ) 3
28742  2B0BD1CD3C2B0511  ) 2
28750  B41BED53A37F7CFE  ) 3
28758  BDBCB0BCE2B04D9  ) 1
28766  C9B0BEC81C7B01BC  ) 8
28774  B0D1CD3C2B11102  ) 7
28782  E953A37FCB1C78B1  ) 4
28790  22A37FC3407B0BC9  ) 2
28798  0B0CD27713E16D7  ) 5
28806  3E15D7AF073E4407  ) 7
28814  CD8479B07DFE0A30  ) 6
28822  E5B7B756F24B011  ) 6
28830  F37A195E235E2301  ) 1
28838  030ED0B6F2B7728  ) 2
28846  772B772B7728772B0  ) 3
28854  36B5B0B12B0B11B0  ) 7
28862  5B21F87AE9E8B0BE  ) 8
28870  2BE11E0BC91F7106  ) 7
28878  B911FB742180B5C5  ) 8
28886  E2B6B5AF8E232B04  ) 5
28894  10FA130AE1E9B109  ) 6
28902  B8CB0B0D3403E123  ) 8
28910  232323235C11FE001  ) 8
28918  2B0B21B5B1E2B18  ) 8
28926  2BCDB678E4D7CD  ) 8
28934  8479B022AA7FCB86  ) 7
28942  79B022AC7FCDB779  ) 3
28950  B9B22AA7FED4BAC  ) 8
28958  7F7323B0B2B128F9  ) 1
28966  C9CDB6780113B811  ) 8
28974  687FCD3C2B0B921  ) 8
28982  F87A3E0A9BC63B07  ) 2
28990  C5B1B0B011837FCB  ) 5
28998  3C2B5E235E232323  ) 1
29006  23E5E0B3CB0BCECB  ) 5
29014  1C783E0B073E0B07  ) 2
29022  2E17B73E07D7AF97  ) 6
29030  E1C11BCE0BC0B56  ) 3
29038  C0C3A0B2CD0B6783E  ) 6
29046  4B97CD0479B022AA  ) 1
29054  7FCB9579B022AC7F  ) 4
```

MONITOR

29862	CDB479B6446DFD3B	13
29870	AC7F2AA02FED8DC9	18
29878	D27E0DFE13D377D0	11
29880	C9CD66703E55D7CD	17
29894	7379D0CD78EFD021	12
29192	A27FFD213A5C3F21	18
29118	3E2D9C3C6B7D0CD	14
29118	8266218DDCD025E	14
29126	2000BD36D20A3D36	18
29134	8103C9D3D6021DDD	18
29142	34D1A4C9D3C3A0202	10
29150	DD36D110C9CD0678	16
29158	8663F22AD7F7CFE	15
29166	022D6218410222A3	12
29174	7F01FC9015E3FCCD	17
29182	3C2021AE7F119F78	15
29190	868CC57BFED22009	17
29198	2323C118F3010300	19
29206	CD3C2005E2333623	18
29214	E5E8DDCD00CEC31C	12
29222	78E1DIC1110D63E1A	19
29230	572EB4D23E8DD72A	18
29238	AB7F22A3F3AC1F	18
29246	6F26D0DDC500DECD	14
29254	1C7B3A497FFE022B	11
29262	8621B41022A3F3E	18
29270	16D23E1B7E2E0D7	11
29278	EB526F26D0DDCD01	16
29286	8ECD1C7B3E16D72E	14
29294	1D0F3E18D7ED5F66	18
29302	2AD90DCD01ECD1C	14
29310	7D2AC07F3E16D73E	19
29318	13D23ED7D7A0D70	19
29326	FE062D0DFE942000	19
29334	AFCD2517C63D7219	16
29342	833E7D7C0253620	18
29350	D710E42A407F22A3	19
29358	7F3E16D23E15D73E	15
29366	8D073EAF323AC07F	13
29374	FE0028D38E4ED73E	18
29382	3D021D063E46D73E	14
29390	46D2D0CD0D36C0C3	14
29398	407DC3867D21FF7F	13
29406	ED5DC2FA2ED52CB	19
29414	011ED11467ECD3C	11
29422	2845C2D9403E1438	18
29430	5021FE7F3E0D279	13
29438	9BE365BCD0D3626	11
29446	0D6FCD1C2D3E1707	14
29454	2E0AD7AFD2E1D0CD	13
29462	8DCEE5CD1C7DE156	12
29470	2D5F2DE5E3E1D7	14
29478	3E1A07AFD2CD1C78	13
29486	E1C118C0C3D0BCD	16
29494	8A7D3E4AD2CD7379	18
29502	0622CA7FCD867DED	13
29510	73E67FED7DC22FD0	13
29518	CD0F5428A21DF23	13
29526	B53AC07FFE0D2001	13
29534	F3DD2A3C7FFD2ADE	14
29542	7F2AC07FE5F1EDAB	17
29550	AE7FE5DD07F2AD2	13
29558	7F0DD92AD47FE7F1	18
29566	D0E94D062FED5D90	13
29574	7F2AD47FD9C3C97F	14
29582	22D27FED23C27FED	16
29590	7BC67FF3E122C07F	17
29598	EB43AE7FE853D07F	14
29606	DD223C7FF022BE7F	11
29614	D9E843D67FED33DB	16
29622	7F22DA7F215D22D9	13
29630	00FDE122D47F00F5	13
29638	213A5CBD1A27FF3	16
29646	00CD8D56CDC3A870	16
29654	CDB6D3E4F07CB73	15
29662	2D9822C4FED5DC4	13
29670	7F0D36D3D1AFED0	10
29678	2D3FEF0203CFEED	10
29686	2D1AFECD2B6D2138	15
29694	7AD11900ED912B5E	11
29702	2120ZA01140ED0D1	17
29710	2051185131A218D	14
29718	7AD10000ED012940	11
29726	1044131AFEED2D1A	10
29734	FECD2D22192940	12
29742	940DED1D2A2196	13
29750	7AD11A0ED1D223	13
29758	1D24131AFE432615	14
29766	FE4D2D11B1313	19
29774	1A218D7A011FD0ED	18
29782	912D4513D6AD3402	16
29790	DD343D3D34D3D34	13
29798	03D3D34D36D321D1	12
29806	7F36D2310FDE0D4D	18
29814	A57F0002AC47F11	14
29822	917FED022C47F11	11
29830	D17F1AFEE92D02A	11
29838	927F22C47FC3CD75	19
29846	FED7D1D131A1FE	17
29854	E92D1D2ADC7F22C4	11
29862	7FC3CD75FEF5D1F	18
29870	131A1DFEE92D92A	18
29878	0E7F22C47FC3CD75	12
29886	1AFEED20DC131A1D	11
29894	F845CA4D25FE4D28	19
29902	2C1AFEF3CA8475FE	12
29910	F3CA8A2521CF2A01	19
29918	290DED1C2DE75FE	14
29926	C32D35FEC3D24FE	14
29934	19CA7D75FEC92855	19
29942	F81DCA9D75CD7F2D	15
29950	7FE4D2B42FE8F2D	14
29958	61FE8222D23CDBD79	16
29966	D2CD75CDCD29ED39	15
29974	C47FED53A07F2A02	13
29982	7F23C47F115F27A7	12
29990	ED52C2CD75AC27F	12
29998	232322C27FC39F77	15
30006	CDDD79D2CD732AD3	16
30014	7F22C47FC3CD75CD	13
30022	D379C2CD75ED73C6	17
30030	7FED7DC27FE1ED73	11
30038	C27FED7DC47F22C4	17
30046	7F11DE73A7ED52CB	16
30054	1D63CD7D7F1A63D	11
30062	0F240D22C47F1B35	16
30070	E61BCDDD79304E3A	19
30078	D27FCD7F281B5AF	18
30086	5793BF2AC47FA7ED	17
30094	5222C47F1D375F1E	18
30102	0D2AC47F191BF25	19
30110	ED4DAE7F2AC07FE5	11
30118	F1D5C3E122C07FED	18
30126	43AE7FF113C2AF32	17
30134	CD7F1B113E11BF7	13
30142	D0CD00D621D7F28	14
30150	CA7FC94573CDE371	12
30158	D0C3D07FC3D4785D	12
30166	C3E323CD0E72D0FE	12
30174	59CDE973D3DC3D3B	17
30182	C9CD0E72D0FE39CD	13
30190	CDD772C9CD067D11	18
30198	572E11500CD3C28	17
30206	11AE7F06FE1A8F26	17
30214	00D0CD0D0E85C5CD	11
30222	1D7ACD1C7DC1D113	13
30230	1DED0DCD0DCE2ABC	18
30238	7FCD107ACD1C7DCD	18
30246	1D7A2AD2FCD1C78	18
30254	DBC3D0DED127A3A	13
30262	C17F6F260DCD1C78	16
30270	CD107A3ACD7FEA01	16
30278	6F26D0CD1C7BCD1B	12
30286	7A3ACD7F7B7EA01	12
30294	6F26D0CD1C7B3E15	13
30302	D7AFD7C3A27D0FE	14
30310	4130F0FE5433BF40	12
30318	401100D06F260029	14
30326	2929292919364CAF9	16
30334	0113D011322FC33C	11
30342	2DCD4D7DD107AFE	13
30350	0F3037FE1123B5FE	12
30358	137B1CFE12201BFE	11
30366	1029062C2DC7FCD7F2	16
30374	7522D6C7FCD7F2752B	11
30382	E6416F16FE1BDD2B	18
30390	E6411600FDFE3A	12
30398	C02FA23D32C07FC3	18
30406	F2255F16D02D21AD	11
30414	7F1977C3F2252D32	11
30422	C17FC3F275C3D07B	12
30430	3E36D7C98479DB22	18
30438	A07FCD8E206614C5	10
30446	7BDD72B4E1A973E	13
30454	16DD96B4D7AF372A	18
30462	AA7FDDCD00CECD1C	16
30470	7D0AD33E16D73E16	12
30478	DD9A4D7D36D59D4F	17
30486	07020IC4B7D73A04	11
30494	7FFE022D8C3E16D7	16
30502	3E16D3D4D7D3E17	13
30510	D72AA07F2E2322AA	12
30518	7F6F2400DDCD00DE	17
30526	CD1C7B3A447FFED2	18
30534	2D021DFCD941FC1	16
30542	0D1A7CDDCBA04C4	12
30550	AC0ECDA07DDDC3E8	12
30558	7622D27FE122A47F	12
30566	0D73C27FED7DC47F	15
30574	21907E5ED73C47F	13
30582	ED7DC27F2A027FDD	18
30590	22DC7FDD21A27FDD	16
30598	CD8D4DD2A0C7FC3	19
30606	0E73CD0E72A447F	11
30614	2D2D22C47F0117	15
30622	0D1ID7FCD3C20CD	15
30630	1C7DC3D7DFCD01	18
30638	AE7D6DCD01AE20F5	18
30646	CE941F3D0055C3FC9	19
30654	0123D011ED2CD3C	11
30662	2DCBAD77DDF3D123	12
30670	D011CD2CD3CD2D11	18
30678	C9DA1421AE7F3ADD	10
30686	23DFDED73C47F31	16
30694	FF7F21D67D3EDD73	17
30702	C27FED7DC47F3E01	12
30710	3EC07F213D27228A	16
30718	7F213A5C22DE7FC9	14
30726	FD36533D3E07CD93	18
30734	2BCD6DDD3E02C981	18
30742	16FDCD5DEC9E5C5	12
30750	DDCD0DD6DD0468D7B	11
30758	3DC5E3CE85D7BE0E1	16
30766	C10E00CA7ED5236	11
30774	FA19D22D22D7DFED	18
30782	2D22DDC3DD442D1C	13
30790	DD7E02FEDA2D23DD	18
30798	CDD94E20DFFE1D7D	15
30806	2D0AFE833D061B1Z	18
30814	ED7D3DDCDDDDE6	15
30822	79C63DFC3A3D02C6	14
30830	07D1DD3A442FFE	15
30838	0AZD07FE1C7D6320	15
30846	D23C22D2E1E2FFE	15
30854	0D2101DDCD73A04	10
30862	7F11DDD62AFC947	14
30870	031F1DFD5453C11D	18
30878	F3C9FDC3DDEC3DD	15
30886	72DDFE3DC01F32A	16
30894	447F32AD7FDDC3DD	15
30902	9E21CC7FD6B3CDAD	14
30910	2730FEDC201C79FE	17
30918	0520F3FE8420E4D	14
30926	CD0DFE3E8D07CEE8	12
30934	D23ED0D22E01EDE	14
30942	1BDCFE262B1BFE3D	12
30950	3D0AFE3A3D1D0DCD	12
30958	0D3E20C4FE4130C6	10
30966	FE4230AD0CD0D36	17
30974	3D0CDDC3D0DE7723	18
30982	D7103211CC7F2EFE	15
30990	2611D0D02B263CD4	14
30998	3D0AFE5DDE16D03	10
31006	C97D3D3CDD57D01	12
31014	ED0D2E0D6D3D2D6A	17
31022	193D10FAEDDD25C1	11
31030	1D61D3D3E1D3204	14
31038	2F2E5DDE1D0D6C5	14
31046	2DDD3CD0D7DD1E	13

MONITOR

```
31034 DD7E00063DFE0A38 ) 2
31042 03B407FED0C70841 ) 8
31050 3D19FAE3C1DD2310 ) 0
31058 DEE8DD21A2F7AA00 ) 3
31066 2F32A47FC9DD5D00 ) 5
31074 11DD7ECD3C20CDAD ) 8
31082 7DDD3E00CD9D10C ) 4
31090 0E112C7ECD3C20CD ) 4
31098 AD7DDD3E0DDD7C9D1 ) 2
31106 BC0011A7ECD3C28 ) 5
31114 CDAD7DDD3E0DDD7C9 ) 2
31122 D110001110F7ECD3C ) 7
31130 28CDAD7DDD3E0DDD7 ) 6
31138 C9D10E0D111E7ECD ) 8
31146 3C20CDAD7DDD3E0D ) 4
31154 D7C9E0D73C6F7ED7D ) 6
31162 C2FF2AC47FE5E3D3 ) 6
31170 C2FE5D7DC6F7C9E6 ) 0
31178 3D3F3AC8FF5F7DE6 ) 6
31186 3D2D2FE1D2B15FE ) 1
31194 2D2D0A7B17171717 ) 8
31202 AAC07F1B177B1FA0 ) 0
31210 CB571B1B7B1F3F1F ) 6
31218 AAC8421B8F7B1717 ) 5
31226 17AAC8F7F2B02A7C9 ) 9
31234 3FC9112FF2F1D1D30 ) 0
31242 C03C2B0941424344 ) 7
31250 45464A4C4D4E4F50 ) 0
31258 515253555456216F ) 9
31266 0A6F1D7D7C7D0672 ) 2
31274 FF2D3573727172711 ) 1
31282 BC1D6739621D9F8 ) 8
31290 E371F279FF1D07E ) 8
31298 E773EF6EEE6DE0D ) 5
31306 0AD3CEC63E3D3630 ) 7
31314 2E2B262C1E1B1E10 ) 0
31322 0E0E11121222A31 ) 8
31330 323AC2C3C4C4CCC9 ) 2
31338 D2D4DACE2E4EAEC ) 2
31346 F2F4FAFC7D736263 ) 6
31354 5B534843212224A36 ) 0
31362 262E343534645658 ) 6
31370 6A6E7071727374F9 ) 5
31378 777E868E9A9EA6AE ) 4
31386 B6BEFE4EEEE6DE0B ) 8
31394 CEC6DE6AEA6AE9E6 ) 6
31402 8E8E2E26E66E6D5A ) 6
31410 4E463E2E261E16DE ) 0
31418 0EFFFCFAF8F2F4F2 ) 7
31426 F8EFECEAE8E2E4E2 ) 5
31434 E8DFDCDA8D7D4D2 ) 5
31442 D8CFCBCCCAC9CBC7 ) 7
31450 C4C3C2C03B302020 ) 7
31458 1010000000000000 ) 2
31466 0000000000000000 ) 0
31474 0000000000000000 ) 0
31482 0000000000000000 ) 0
31490 0000000000000000 ) 0
31498 0000160000C130111 ) 5
31506 031007404F4E4954 ) 7
31514 4F52100011021500 ) 2
31522 180203416C246572 ) 0
31530 2D6D65D6F727916 ) 2
31538 03034227285616070 ) 2
31546 8F8F6E7416040343 ) 6
31554 6F6E7665727420E ) 3
31562 756D62652216D03 ) 3
31570 44656C6574652062 ) 6
31578 72656416D04F6F6E ) 6
31586 7416E6D34572616D ) 7
31594 696E5520737A6163 ) 6
31602 6D6D20546665C6C ) 1
31610 42C6CF63D1A0003 ) 0
31618 4A7360202074AF28 ) 2
31626 726F7574696E6516 ) 6
31634 0D034C6F6F6D2D61 ) 4
31642 742D6222656168PP ) 0
31650 6F696E2473160003 ) 0
31658 4D6F7665202D5560 ) 3
31666 6F72792D626C6F63 ) 0
31674 6D16D0D34E756D62 ) 0
31682 6972206261736520 ) 3
31690 746F676C6520AE6F ) 5
31698 7314B034FAE452D ) 2
31706 7374657D2D726F75 ) 1
31714 746965E65160D35D ) 1
31722 72696574657223074 ) 3
31730 6F67626C6520E6F ) 2
31738 7216D2D31726979 ) 0
31746 16D0D3526574973 ) 0
31754 74657220646973 ) 1
31762 6C61791610D35370 ) 6
31770 65636966792D0540 ) 4
31778 74727920766616C75 ) 0
31786 65731611D3557365 ) 2
31794 2D6F746D65722070 ) 6
31802 726F6772616D1612 ) 0
31810 D5566965722D6D65 ) 3
31818 6D6F72791613D35A ) 7
31826 65726F2072656769 ) 0
31834 7374657273161407 ) 7
31842 1D017632E31287F ) 5
31850 284A6F6E2D45C6C ) 6
31858 697320313D3D316 ) 4
31866 15D313D11D31201 ) 3
31874 41726520796F7520 ) 1
31882 1D1D2420796F7520 ) 8
31890 7325726520F2020 ) 1
31898 592F4E2913D01200 ) 1
31906 10D16150202020 ) 1
31914 2020202020202020 ) 0
31922 2020202020202020 ) 0
31930 2020202020202020 ) 0
31938 2020202020202020 ) 0
31946 2020202020202020 ) 1
31954 13D11D01543D020 ) 2
31962 5265426973746572 ) 6
31970 2D53652416D20013 ) 6
31978 D01D24E6F726D61 ) 5
31986 6C2D32656769737 ) 1
31994 6572733A16408410 ) 8
32002 D0412D0D16D41342 ) 4
32010 43202D4D3D34445 ) 3
32018 3D2D16D51D40C28 ) 2
32026 2D16D7D1D0445D ) 1
32034 636D616E6265202D2 ) 6
32042 6D6769737465223 ) 0
32050 3A16D0D31D0D4127 ) 7
32058 4627282D16D1342 ) 7
32066 27432722D16D4D3 ) 5
32074 4427452722D2D16D ) 3
32082 1340274C2722D216 ) 4
32090 0C0D10D3537D0563 ) 3
32098 D9616C2D32656769 ) 7
32106 7374657273A16D5 ) 0
32114 03100D492E2D2D16 ) 1
32122 0F1349592D2D16D5 ) 0
32130 03532D72D16D4F13 ) 0
32138 5D432D2D16D0449 ) 3
32146 2D2D16D14522D2D ) 6
32154 1612D10D1466C41 ) 0
32162 67233A16120753 ) 7
32170 5A2D2D2D4D2D2D ) 1
32178 5D2D4E2D43D0D16 ) 6
32186 1D0D1D2494E2465 ) 4
32194 7272757D74723A10 ) 2
32202 D016D41D16D3D016 ) 2
32210 D3161D3D0A16D91A ) 5
32218 16AD016DA1A160 ) 2
32226 0D16D1E1D16D0D16 ) 1
32234 0F1D342D16D44472 ) 2
32242 4572312013E1200 ) 2
32250 4274D01291E1200 ) 2
32258 17D2D03A2D0D27974 ) 1
32266 4512D13E12D01707 ) 7
32274 D03A2D6726F6012 ) 8
32282 D13E12D01707D03A ) 5
32290 2D746F12D13E1200 ) 2
32298 16D0D31D0D7557365 ) 2
32306 72203741636D10 ) 3
32314 D016D0D31D0D25573 ) 4
32322 6572223D5676975 ) 5
32330 2465722731D0D0D61 ) 6
32338 D2D2D2D2D2D2D2D2 ) 5
32346 423A0D6329202020 ) 0
32354 2020453A0D642920 ) 6
32362 2020202443A0D65 ) 0
32370 292020202020C3A ) 3
32378 0D6429202020C3A ) 4
32386 4D3A0D6729202020 ) 4
32394 2D4223D0D6829 ) 7
32402 2020204173A0D69 ) 0
32410 292020202043273A ) 0
32418 0D6A292020202042 ) 5
32426 273A0D6D29202020 ) 5
32434 2D45273A0D6C2920 ) 2
32442 2020204223A0D6D ) 0
32450 292020202042273A ) 0
32458 0D6E292020202048 ) 7
32466 273A0D6F2920202D ) 3
32474 2D4958A0D702929 ) 1
32482 2020204953A0D71 ) 4
32490 292020202020413A ) 7
32498 0D72292020413272 ) 5
32506 793A0D7329202053A ) 7
32514 65726F3A16D1D15 ) 0
32522 01120D0D16D1D0 ) 6
32530 01456E7465722076 ) 5
32538 616C25453A10D0D ) 1
32546 0D1704D0444453269 ) 3
32554 6D616C3A2D0D17D4 ) 3
32562 0D4D65PD3A2D0D17 ) 1
32570 04D04269AE617279 ) 1
32578 3A2D16D0A13D110 ) 5
32586 01427265616D7D6F ) 6
32594 696E74731D0D1D0D ) 0
32602 0D0D17D7D0170D0D ) 4
32610 2E2E2E2E2D0D0613 ) 5
32618 011D0212D1422265 ) 3
32626 616D13D01D0D12D ) 7
32634 2D617422D0D5D6D ) 1
32642 0000000000000000 ) 0
32650 0000000000000000 ) 0
32658 0000000050270000 ) 0
32666 3A5C0000F07F0000 ) 1
32674 A4AE01C300000000 ) 4
32682 0000000000000000 ) 0
32690 C38E23000000000 ) 5
32698 C39E73000000D0D ) 2
32706 300CEF500C0250CE ) 0
32714 C0F2710EF3D47317 ) 4
32722 C41EA7817A6C73E ) 0
32730 753E000000000000 ) 5
```

Listing 3

Error checker

```
10 REM ######################
20 REM ##    HEX  DUMPER   ##
30 REM ## by Jon Ellis 1985 ##
40 REM ######################
50 FOR F=28350 TO 32767 STEP 8
70 PRINT F;
80 LET CHECK=0
90 LET h$=""
100 FOR g=1 TO 8
110 LET byte=PEEK (F+1+g)
120 LET h1=INT (byte/16)
130 LET l=byte-16*h1
140 LET h$=h$+CHR$ (h1+48+(7 AN
D h1>9))+CHR$ (l+48+(7 AND l>9
))
150 LET check=check+byte*g
160 NEXT g
170 PRINT TAB 8;h$;
180 LET digit=check-90INT (chec
k/9)
190 PRINT TAB 27;" ) ";digit
200 NEXT F
210 STOP
```

Ride the thermals in Quicksilva's glide and destroy mission.

GLIDER RIDER

Glider Rider
Quicksilva
£8.95

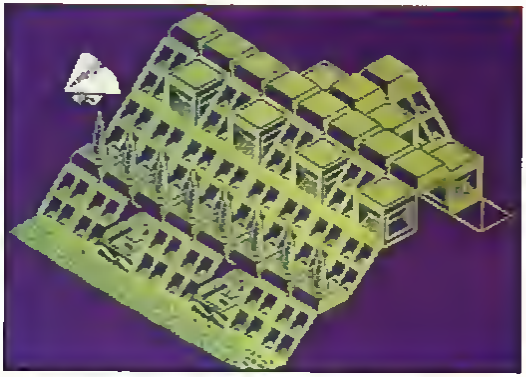
This is a real dare devil mission As Commander Glenn White you are dropped onto an island — your objective is to destroy the nuclear reactors that power the munitions plant owned by the Abraxas Corporation (Arms for Anyone, Anywhere, Any Reason).

For the mission you have been provided with a trail bike which converts into a hang glider. The trail bike will take you over rough territory and the conversion to hang glider is very slick — simply find a slope, career down it, reverse direction and the hang glider opens out like a butterfly and you are in the air. Staying in the air however is a different matter as practically all the installations on the island are heavily defended by ground to air lasers which if they lock onto you mercilessly sap your energy rating.

Puttering about on the motorbike is enjoyable and the grand tour of the island is recommended before attempting your objective. You can drive round the perimeter of the island without too much interference from laser outposts and appreciate a) the size of the island and b) the excellent and well thought out detail in the contoured 3-D graphic landscape. Then find an incline and take off. Mastering the controls of the hang glider takes some time as it seems to react as an actual hang glider would — bank too steeply and it stalls, if you are over the ocean and ditch you are immediately consumed by predatory sharks.

Flying around and across the island is fun but it's when the serious business of bombing hell out of things gets underway that a few flaws in the game are revealed. You can only bomb installations from the glider and are given a ration of nine (extra supplies can be picked up from ammo dumps by using the bike) but the question is what do you bomb and how do you know when you've hit it?

The instructions are hazy at best, hinting that 'power units are vulnerable' But what are power units? There are all kinds of structures on the island so where do you start? An index to buildings would have been a very useful aid.



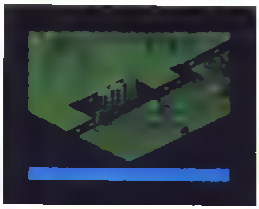
The second problem is whether it's actually possible to destroy anything. Drop a bomb and there is no sign of an animated explosion.

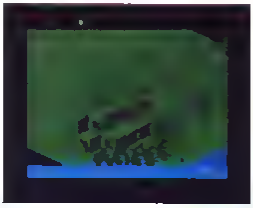
One solution of course may be that I'm too jittery to control the hang glider or too myopic to aim properly but the fact is that I spent a great deal of time and concentration just attempting to register a hit on something — anything.

I tried dropping bombs from every conceivable height and angle on any potential target. The result? Nothing. (Bombs also have a disconcerting way of disappearing in mid air if you happen to switch screens as you fly over a target)

This, to say the least, is very annoying and it's all the more infuriating because everything else about the game is very appealing. Making things difficult for the player is all very well but getting a foothold on the game should be easier than this. This fact is the only thing that prevents Glider Rider from becoming a Monster Hit. It's a game I shall return to again in an effort to crack it, but I can't help thinking that this one should have been called Mission Impossible (literally) if someone hadn't thought of the title first.

GREAT





THE BEST OF BEYOND

Christmas is coming and Beyond are ready with an early prezzie for strategy and adventure fans.

The Best of Beyond
Beyond Software
£9.95

Beyond have always been stronger an strategy/adventure than an arcade games (do I hear Superman being mentioned anywhere?), and now, just to tide us all over while we're waiting for Dark Sceptre and Star Trek to arrive, they've gathered together four of their best-known titles together anto a compilation tape.

The games assembled here have all had their fair share of acclaim — **Doomdark's Revenge, Shadowfire** and **Enigma Force,** with only **Sorderon's Shadow** as a slightly less well-known game.

It seems almost pointless to rehash Doomdark's Revenge, especially as Mike Singleton's 'landscaping' technique caused such a fuss when it first appeared in Lords of Midnight But Doomdark took the technique even further, to produce a massive fantasy epic in which, playing the part of Prince Luxor and controlling various other characters and armies, you embark on a quest to free the land of Midnight from the threat of Shareth the Heartstealer The game allows you to enter commands via single key entry (w=look, q=move), and the six thousand locations, 48,000 landscaped views and the various characters and objects that you have to deal with make for a vast and complex game that has been keeping hardened adventure addicts glued to their keyboards ever since it was first released

A second tape in the package also includes a recording of a dramatised version of the story of Doomdark's Revenge — a must for lovers of purple prose.

The Shadow

Sorderon's Shadow is next on side one, and again there's a touch of the landscapes as you attempt to free the land of Elindor from the rule of the not-very-nice wizard Sorderon

If you can complete the nine tasks set by The Un named One you may be able to cast the final spell that will end Sorderon's power To complete these tas' you'll have to trek around Elindor collecting various magical objects from the characters who inhabit the land The game is more of a conventional adventure than Doomdark despite the landscaped graphics, and entry of commands is of the normal Get the sword, kill the ork' method rather than single key entry (though the command editor is fairly sophisticated) Sorderon's Shadow suffers a little bit because the landscaped graphics invite a not really appropriate comparison with Doomdark, possibly leading you to expect more than the game delivers. Underneath the visually attractive presentation, Sorderon's Shadow is a fairly good, but by no means outstanding adventure.

The Enigma team

Shadowfire and Enigmaforce (both written by Denton Designs) are sensibly put together on side two of the tape, as they both feature the adventures of the Enigma team Shadowfire caused a huge fuss when first released as it was one of the first games to feature a truly sophisticated icon control system Both games put you in control of Zark Syylk, Sevrina, and Maul of the Enigma team as they attempt to foil the plans of the galactic despot, General Zoff

Enigma Force

The challenge presented by the games lies in balancing the strengths and weaknesses of your team members and deploying them effectively against the forces controlled by Zoff As with Doomdark, these games do not offer a single, clear cut path to victory and theres always room for improvement and new tactics. Shadowfire featured only the icon system and a static display of the characters and their positions, but in Enigma Force this had been upgraded to an animated display in which you could actually see the characters move in response to your commands.

My only quibble about these games was that I found the icon system a bit fiddly to cope with, but there's no denying the difficulty of the challenge that the two games present you with or the quality of the games design With four games like this all on the same tape Beyond have produced a high-class compilation which, assuming you haven't already got most of the games, represents good value for followers of adventure and stategy games.

Doomdark's Revenge

MONSTER HITS

QL COLUMN

Anthony Stewart faces the inevitable.

THE PCW Show has come and gone for yet another year and there was hardly a QL in sight Digital Precision was an exception and the company had the courage to flaunt its sentiments with a sign reading **"QL only and proud of it!"** But everything else was Amstrad or Atari and even the new Spectrum +2 seemed to take a back seat to Amstrad's launch of an impressive-looking, inexpensive PC obviously aimed at capturing the poor-man's-IBM market Sadly the QL looks as dead as the proverbial door nail but let's postpone the obituary for a little while and talk about happier things for a bit

THOR, CST's reincarnated, higher life-form, QL was there in force and it's a good-looking machine CST and I have something in common, neither one of us can manage to get any comment out of Amstrad! While I'm still waiting for that elusive Amstrad PR man to "check with the client and get back to me", CST has been taking the bull by the horns and telexing the company directly to try and reach an accommodation over Thor's use of QL circuit boards. They haven't heard a licky-boo so maybe it's not just me maybe Amstrad doesn't talk to anybody about anything I did have to grin, however, at the sight of a CST exec (company ID badges conspicuous by their removal) taking splashy hand-outs from a smiling, PC-promoting Alan Sugar It's the sort of thing that makes you want to root for the underdog even if you aren't willing to put a few quid on him

QL mouse

Those hard-to-find West Germans finally reappeared at the Show and I got a chance to play with their QL mouse and software (a desk-top manager and a Superbasic extension) package that sells for around £90 It seems excellent in all respects and makes an ideal alternative to Eldersoft's ICE and mouse combination (which costs about the same) but — save for the odd computer show — you can only reach these people by contacting them at Giga-soft in Dusseldorf (full address in the odd ZX Computing advert or supplied upon request) so Eldersoft probably doesn't have a lot to worry about

There was no new QL software worth mentioning and more surprisingly very little new stuff for the Spectrum So as not to totally waste my tube-fare, I got a couple of games for my Spectrum In particular, Trivial Pursuit (from Domark) looks a winner and, for the less trivially-minded, action-games players amongst you, Strike Force Cobra (Piranha), Night Rider (Ocean) and TT Racer (Digital Integration) are providing my nine-year-old son (and his father) with endless hours of amusement In case you suspect that his father is trying to avoid talking about the inevitable, you happen to be just about spot-on and — here it is — the QL is now history in the past tense. The quantum leap is dead and gone.

R.I.P.

I talked to quite a few of the major QL suppliers and software houses and, when I could get them to stop going on about the new Amstrad PC, they all said much the same thing It's finished and Amstrad rules the day Microdeal, which has supplied numerous QL games and an excellent flight simulator, told me (on their stall in the Atari exhibition) that nobody's really sending in any more QL software for possible publication Obviously our games-designing friends throughout the land, having spotted the inevitable, have moved on to fresher and more profitable climates. Some of the other, more heavy-duty software houses said much the same thing after all the jargon was translated into day-to-day English Alright, so there's Thor but it's a different type machine at a price few home-micro users are going to look at for long As a business package or system for the richer home user, it looks very good but it's not the quantum leap that Sir Clive tried to give us at every-day prices.

So don't expect much in the way of new QL software There will be some in the days to come but the flood gates that only started to open a few short months before Sinclair computers got themselves a new owner have shut again and we are back into a square-one-situation (or worse) But all isn't gloom and despair There's a large amount of quality software for the QL already on the market to keep most owners in business for the lifespan of their computers. Those of you who are toying with the idea of buying one ought to keep thinking and not look elsewhere too quickly If you want a good computer at a rock-bottom price (which just might get a bit more rock-bottom before too long) which will last for a few years and which has a lot of very good software (which, if not exactly selling far next to nothing is economically priced and is definitely going to get cheaper), a QL is still something worth looking at

The QL's ghost, like old John Brown's, goes marching on even if the body lies a mouldering in the ground Go have a look at the new Amstrad PC but forget about all the flashy sales stuff telling us that it's the greatest thing since pop-top beer cans and fated to make IBM decline into obscurity What you are going to see is the gadget that Sir Clive tried to market but didn't It's got the built-in disc drive that the QL should have had instead of those temperamental microdrives. It has an excellent keyboard and comes with a monitor The basic package costs some £399 and a few hundred more will give its owner a top-notch system Amstrad's only mistake as far as I can see is to endlessly go on about the PC's IBM compatability and why it's a better deal Both are no doubt true, but who really wants to buy an imitation IBM when they might just be able to save enough coppers to buy a real one?

All this is what Sir Clive tried to do a few short years ago (except that he had the guts if not the good sense not to go for an IBM clone) and it's just that Amstrad is profiting from his errors and their own undoubted marketing expertise. Amstrad is even promising us a high-quality chess package for the PC but what did Sinclair give us straight-away (when most software houses were still waiting to see how things were going to shape up)? A first class chess package that's still unbeatable. When you do have a look at what will undoubtedly be a disgustingly successful business venture, remember the famous words of what's his-name

"Of all the words of paper of pen, the saddest are these 'It might have been'" I can assure you that Sir Clive will

SPECTRUM/QL LINK-UP

They said it couldn't be done, but David Nowotnik shows how to get a Spectrum and QL communicating with each other.

Last month I described how data could be passed between the Spectrum and QL computers via their network ports. We discovered that while communication by this route is possible, certain incompatibilities between the two computers' network systems made data transmission and reception slow and unreliable. But both computers offer an alternative — the RS232 ports, and this, you should find, offers far greater reliability and speed.

As with network communication, you will need an Interface 1 for your Spectrum to allow the QL and Spectrum to 'talk' to each other. In addition, you will need a special lead. If you are handy with a soldering iron, then you might like to try making up your own lead. If not, then try one of the companies who regularly advertise in 'ZX Computing' and other magazines with special QL RS232 leads.

On both computers the connectors are non-standard for RS232 lines. At the QL end the connector is a British Telecom plug (the sort you'll have at the wall end of your telephone if your telephone is transferrable). And for Spectrum connections you'll need a nine pin D-plug, the sort that will fit into Atari joystick plugs. Both types of plug, and the lead to connect them can be obtained from specialist electronic and telephone supply shops.

The BT plug requires great skill (and a specialist tool) to wire up the five leads necessary to complete the link. If you don't have the confidence to try this for yourself, you could 'sacrifice' the RS232 lead supplied to link the QL to a printer, by removing the standard RS232 plug and connecting the D plug.

Pin connections to be made at both the QL and Spectrum ends are listed in table 1. The QL has two serial ports, and both are wired slightly differently, so decide in advance which serial port you wish to use (the examples used later on use ser1), and wire the D plug according to the appropriate column in the table. If you elect to sacrifice a QL printer cable then the appropriate wire colours are shown alongside the D-pin number to which it is connected. D pin numbers are shown in Fig 1 (viewing the plug from the back, the side to which leads are soldered). If you are wiring a BT plug, then pin 1 is the one farthest from the plastic leg of the plug.

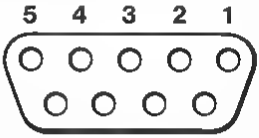


Fig.1. Diagram of D plug pin connections

Getting wired

Of the five wires which connect the two serial ports, two are for data communication (data flow is unidirectional on each wire) and two provide simple switches to permit transmitter and receiver to tell each other if they are ready for data communication. These work by placing a voltage on the line to indicate a state of readiness. That voltage is relative to 'ground', which is the fifth line to connect both computers.

Once you have connected or purchased your RS232 lead you might still have problems getting the two computers talking to each other. This is because the RS232 'standard' is far from being absolutely standard. With RS232 data is transmitted serially i.e. one bit after another along a single line. This data can travel at different speeds, and transmitter and receiver must be set to talk and listen at the same speed. The speed of transfer is known as the baud rate (bits per second), and we'll see in a moment how the baud rate is set on both computers.

There are other possible RS232 mismatches between transmitter and receiver which can cause problems, things called parity bits and handshaking. Fortunately, the default setting on QL and Spectrum are similar, so they need not concern us here. But beware of these potential problems when linking your computer to any other device.

So, with your computer turned on, and RS232 lead connected, you are ready to test out your wiring efforts. Try the test routine in Fig 2. Type in the program lines to each computer, **SAVE** them, and **RUN** both computers. Once both programs are running, you need only type on the QL keyboard. The INPUT cursor will flash in window #0, and anything you type in and ENTER will (if all is well) appear on the Spectrum screen, then on the QL screen. The word or message has to be successfully transmitted to the Spectrum, then transmitted back to the QL before it appears on the QL screen. So, your message on the QL screen means that communication is working in both directions. Note from the listing that it is only necessary to open a single channel on both QL and Spectrum.

Table 1. RS232 Lead - wiring connections

D pin (connect to ser1)	BT Socket	D pin (connect to ser2)
7 black	1	7 black
3 white	2	2 white
2 green	3	3 green
5 blue	4	4 blue
4 red	5	5 red

Communication on a single RS232 channel is bi-directional

The next step is to see which of the various BAUD rates is most reliable. The QL and Spectrum have six transfer rates in common. The listing in Fig 3 is designed to test them out. Again type in the listings, SAVE and RUN them.

In this test, the Spectrum is again the 'slave' of the QL, receiving messages, printing them on the screen, then transmitting them back to the QL where they are tested for errors. The message transmitted appears in the DATA lines 60-90 of the QL listing. Also transmitted are a set of six control codes. These are code numbers which do not correspond to any of the character codes shared by the two machines. The Spectrum RS232 channel has been opened to type 'b' (see your Interface 1 handbook) in line 40 to permit these characters to be transferred. In any Spectrum/QL RS232 communications, it is also preferable to use the "b" (binary) rather than "t" (text) option on the Spectrum side, otherwise odd results might occur.

So, the program loops round from 9600 Baud to 300 baud (line 150 in the QL listing, 40 in the Spectrum listing) sending the same message and set of numbers from QL to Spectrum, then back again. The result of every test is printed on both screens, with the number of errors, and time taken given on the QL screen. The test of time is carried out using the QL system variable at address 163886. Set to zero (line 160), it increments fifty times a second, so when it is PEEKed (line 290) and divided by 50, it gives the time taken more accurately than using DATE (which only gives the time to the second). After each test the program halts, waiting for you to press any key on the QL keyboard.

Fig.2. Simple communication test routine

a) Spectrum listing

```
10 REM   Test of RS232
20 REM
30 FORMAT "b";1200
40 OPEN #4;"b"
50 REM
60 INPUT #4;a$
70 PRINT a$
80 PRINT #4;a$;CHR$ 10;
90 IF a$="stop' THEN STOP
100 GOTO 50
```

b) QL Listing

```
10 REMark  Test of RS232
20 REMark
30 BAUD 1200
40 OPEN #4, ser1
50 REPeat loop
60   INPUT #0,a$
70   PRINT #4,a$; CHR$(13);
80   INPUT #4,b$: PRINT b$
90   IF b$="stop" THEN EXIT loop
100 END REPeat loop
```

Time

There is a fixed time on each test devoted to the testing and printing of results so the influence of different baud rates can only be judged by the differences in time taken. You should find that the accuracy of transfer should not vary much with speed, and very few faults should occur. Surprising, the only fault I found was at the lowest transfer rate 300 baud, when data transfer seemed to fail altogether. Try the test a few times for yourself and confirm these results. It will mean that there is no disadvantage (in terms of reliability), and much to be saved in time by always selecting the maximum baud rate of 9600 which happens to be the default value on the QL.

Last month I gave you a program to transfer BASIC programs from Spectrum to QL using the network system. This

Fig.3 Test of speed and reliability

a) Spectrum Listing

```
10 REM Reliability Test
20 REM
30 LET x=19200: LET h$= CHR$ 10
40 LET x=x/2: FORMAT "b";x
50 OPEN # 4;"b": CLS
60 FOR j=1 TO 4
70 INPUT #4;a$
80 PRINT a$
90 PRINT #4;a$;h$;
100 NEXT j
110 INPUT #4;a$
120 PRINT #4;a$;h$;
130 PRINT
140 FOR i=1 TO 6
150 PRINT  CODE a$(i)
160 NEXT i
170 PRINT 'Baud =";x
180 INPUT #4;a$
190 CLOSE # 4
200 IF x>300 THEN  GO TO 40
```

b) QL Listing

```
10 REMark     RS232 test program
20 REMark
30 x=19200: e$='": h$= CHR$(13)
40 DIM a$(4,28): RESTORE
50 FOR i=1 TO 4: READ a$(i): END FOR i
60 DATA "This is a test of speed and
70 DATA "reliability of the transfer '
80 DATA "of data between the QL and  "
90 DATA  Spectrum computers."
100 DATA 120,254,255,0,23,5
110 FOR i=1 TO 6
120   READ z:e$=e$& CHR$ (z)
130 END FOR i
140 REPeat loop
150   x=x/2: BAUD x: er=0: CLS
160   POKE_W 163886,0
170   OPEN #4, ser1
180   FOR j=1 TO 4
190     PRINT #4;a$(j);h$;
200     INPUT #4,v$: PRINT v$
210     FOR k=1 TO LEN (v$)
220       IF v$(k)<>a$(j,k) THEN er=er+1
230     END FOR k
240   END FOR j
250   PRINT #4;e$;h$;
260   INPUT #4;v$
270   IF v$<>e$ THEN er=er+1
280   PRINT\ "Baud = ";x;" Errors = ";er
290   t=INT (PEEK_W (163886)/50)/10
300   PRINT "Time = ";t;" seconds"
310   e$=INKEY$(-1): v$="nor't": PRINT #4;v$;h$;
320   PAUSE 50: CLOSE #4
330   IF x=300 THEN EXIT loop
340 END REPeat loop
```

```
Fig.4. RS232 transfer of Spectrum programs to QL

a) Spectrum Listing

9980 FORMAT "b";@9600
9981 GO SUB 9999
9982 LET key=r: LET r=0
9983 OPEN # 3;"b": PRINT #3; STR# k; CHR# 10;
9984 FOR i=1 TO k
9985 GO SUB 9997
9986 LET s#= CHR# ( PEEK 16+r)
9987 LET r=r+1: PRINT #3;s#;
9988 NEXT i
9989 CLOSE # 3
9990 STOP
9997 LET a= PEEK 23635+256* PEEK 23636
9998 LET y= PEEK 23627+256* PEEK 23628
9999 RETURN

b) QL Listing

100 REMark Import Spectrum Programs
110 REMark via the RS232 line
120 :
130 REMark Initialise
140 :
150 CLS :PRINT " Initialising - please wait"
160 a= RESPR (8)
170 IF a> 221184 THEN a= RESPR (a-221184)
180 NET 1
190 s= CHR$(13)
200 position=at RESTORE 1000
210 DIM keyword$ (91,10), key_len (91)
220 FOR i=1 TO 91
230   READ a$: keyword$ (i)=a$
240   key_len (i)= LEN (a$)
250 END FOR i
260 :
270 REMark Transfer program from Spectrum
280 :
290 BAUD 9600: OPEN #3, ser1
300 INPUT #3;name$: name$=a$
320 PRINT \" Receiving the program"\" from the Spectrum"
330 FOR i=1 TO num
350   a= INKEY$(#3,-1)
360   POKE position, CODE (a$)
370   position=position+1
400 END FOR i
430 CLOSE #3
440 PRINT \\" Transfer complete"\\
450 :
800 REMark Create file of BASIC lines

810 :
820 PRINT " Place a formatted cartridge"
830 PRINT " in mdv2_, then press any key"\\
840 a$= INKEY$(-1)
850 DELETE mdv2_temp_bas
860 OPEN_NEW #4,mdv2_temp_bas
870 REPeat loop2
880   REMark line number first
890   a$=256*PEEK(a+1)+PEEK (a+2): a=a+4
900   IF a$="9999" THEN EXIT loop2
910   REPeat loop3
920     y= PEEK (a)
930     SELect ON y
940     =32 TO 127: a$=a$& CHR$(y)
950     =128 TO 143: a$=a$& 1
960     =144 TO 164: a$=a$&  ( &CHR$(y-79)& )
970     =165 TO 255
980       a$=keyword$ [y-164]: k$=x$[1 TO key_len (y-164)]
990       a$=a$&k$
999     =13: EXIT loop3
1010    =REMainder : a=a+5
1020    END SELect
1030    a=a+1
1040  END REPeat loop3
1050  PRINT #4; a$
1060  PRINT #4
1070  a=a+1: IF a>=position THEN EXIT loop2
1080 END REPeat loop2
1090 CLOSE #4
1099 :
1100 DATA  "@@@"  ,  INKEY$  ,  PI  ,  FN
1010 DATA  POINT  ,  SCREEN$  ,  ATTR  ,  AT
1020 DATA  TAB  ,  VAL$  ,  CODE  ,  VAL
1030 DATA  LEN  ,  SIN  ,  COS  ,  TAN
1040 DATA  SQR  ,  ACS  ,  ATN  ,  LN
1050 DATA  EXP  ,  INT  ,  SGN  ,  ABS
1060 DATA  ABS  ,  PEEK  ,  IN  ,  USR
1070 DATA  STR$  ,  CHR$  ,  NOT  ,  BIN
1080 DATA  OR  ,  AND  ,  <=  ,  >=
1090 DATA  <>  ,  LINE  ,  THEN  ,  TO
1100 DATA  STEP  ,  DEF FN  ,  CAT  ,  FORMAT
1110 DATA  MOVE  ,  ERASE  ,  OPEN #  ,  CLOSE #
1120 DATA  MERGE  ,  VERIFY  ,  DEF  ,  CIRCLE
1130 DATA  INK  ,  PAPER  ,  FLASH  ,  BRIGHT
1140 DATA  INVERSE  ,  OVER  ,  OUT  ,  LPRINT
1150 DATA  LLIST  ,  STOP  ,  READ  ,  DATA
1160 DATA  RESTORE  ,  NEW  ,  BORDER  ,  CONTINUE
1170 DATA  DIM  ,  REM  ,  FOR  ,  GO TO
1180 DATA  GO SUB  ,  INPUT  ,  LOAD  ,  LIST
1190 DATA  LET  ,  PAUSE  ,  NEXT  ,  POKE
1200 DATA  PRINT  ,  PLOT  ,  RUN  ,  SAVE
1210 DATA  RANDOMIZE  ,  IF  ,  CLS  ,  DRAW
1220 DATA  CLEAR  ,  RETURN  ,  COPY
```

was reliable only when each byte value was transmitted as a number, and the channel opened and closed with each transmitted number. As you have seen, the RS232 line is far more reliable, allowing data to be sent as a stream of 8-bit characters at 9600 bits per second. To make use of this faster and more reliable transfer rate (particularly useful in longer programs) program transfer can be improved using the RS232 line. Fig 3 contains the listing of the transfer program converted for use with the RS232 link. To use the programs, **MERGE** the Spectrum listing with the program you wish to transfer, and **RUN** the QL program, with a microdrive cartridge in mdv2. Type and enter **RUN 9980** on the Spectrum. The program will be transferred, then translated to an ASCII file at the QL end, and stored on microdrive under the file name of 'temp__bas'. This can be loaded into the QL as a normal BASIC program. The QL adds the word 'Mistake' to the beginning of any line which is syntactically incorrect, and you may well see several of these when you list the program. In addition to these modifications, other changes will no doubt be necessary for the program to run successfully on the QL. But transfer of the program can save a lot of effort compared with re-typing the whole program.

Another benefit QL users could derive is in the transfer of the Spectrum screen display to the QL. Despite the limitations on its screen display, some excellent colour pictures can create for the Spectrum. With comparatively little available for the QL in this respect, programmers could transfer their favourite Spectrum screen displays, then import them into a graphics program (eg GraphiQL) for modification. The listing in Fig 5 allows the screen display to be transferred.

Screens

Once both listings are entered and saved, RUN them. The Spectrum screen asks you to press play on your tape recorder. It assumes that you have a tape in the recorder containing the screen display you wish to transfer, and that the screen display file is the first file it will find on the tape. In the meantime, the QL screen is asking for a file name for the screen. Once the transfer is complete, the screen display is saved to microdrive 2 using that filename.

Once the display is loaded on the Spectrum screen, the border will flash, indicating transfer of data via the RS232 line. Attribute data is transferred first, and saved in an array (att__arrays) in the QL. At the same time, the paper attribute colours are displayed on the QL screen. In order to achieve the spectacular displays on the Spectrum's limited display file, some clever tricks have been used, and PAPER and INK are not always what you think they are. By first printing all of the PAPER blocks, you can see the clever way Spectrum pictures are made up. Next all the pixels are transferred. This is a slow business, it's not the transfer rate which is a problem, but all the calculations which are necessary by both computers. The Spectrum has to calculate the byte address of each block of eight pixels. This it does in line 260 with the aid of a small machine code routine installed in the user defined graphics area of RAM (installed using the subroutine starting at line 1000 of the Spectrum listing). The QL works out which bits in each byte are INK and which are PAPER, and laces the appropriate pixel colour on the screen. Unless you are fascinated by the picture slowly building up on the QL screen, go and enjoy a cup of tea while this is going on! The display will fill a QL monitor screen, so you may find it will overflow if your have a TV as your QL screen.

There can be many applications for the transfer of data between two computers. In

this article, and the one last month, you should see how this is possible (knowing the limitations) between Spectrum and QL, and the principles developed could be applied to any application you may require.

```
Fig 5  Transfer of Spectrum screen display to QL

a) Spectrum listing

10 BR BLU 1000
20 PRINT "Press Play on your tape recorder"
30 LOAD "" SCREEN$
50 OPEN # 4;"b":9000
120 FOR i=0 TO 31
130 FOR j=0 TO 23
180 PRINT #4; CHR$  ATTR (j,i);
190 NEXT j
160 NEXT i
170 PRINT #4;"pixels"
230 FOR i=0 TO 192
240 FOR j=0 TO 31
250 POKE 32747,i: POKE 32750,j: POKE 32763,i
260 LET st=16384+32* USR 32760+256* USR 32744+ad USR 32752+j
270 LET p= PEEK st
280 PRINT #4; CHR$ p;
290 NEXT j
300 NEXT i
310 CLOSE # 4
990 STOP
1000 RESTORE
1010 FOR i=32744 TO 32767
1020 READ a: POKE i,a
1030 NEXT i
1040 RETURN
1050 DATA 6,0,62,0,230,7,79,201
1060 DATA 6,0,63,0,230,24,79,201
1070 DATA 6,0,63,0,230,192,79,201

b) QL Listing
10 REMark Spectrum Screen Transfer
20 :
30 INIT
40 INPUT \\"File name for screen display "name$
50 PAPER_ATT
60 delay: PRINT_INK
70 SAVE "mdv2_"&name$,131072,32768
80 STOP
90 :
100 DEFine PROCedure INIT
110 WINDOW 512,256,0,0: PAPER 0
120 MODE 8: CLS
130 DIM att_array$(32,24)
140 BAUD 9600
150 OPEN #4, ser1
160 END DEFine INIT
170 :
180 DEFine PROCedure BRIack ll,x,y:
190 BLOCK 16,10,16*x,10*y,l
200 END DEFine
210 :
220 DEFine PROCedure PAPER_ATT
230 LOCal t,j,a$,att
240 FOR i=0 TO 31
250   FOR j=0 TO 23
260   a$=INKEY$(4,-1): att=CODE(a$)
270   att_array$(i+1,j+1)=a$
280   att=(att&256)/8+ BRIack att,i,j
290   END FOR j
300 END FOR i
310 END DEFine PAPER_ATT
320 :
330 DEFine PROCedure PRINT_INK
340 LOCal t,j$,ok,i,j,k,row
350 row=0
360 FOR i=0 TO 191
370   FOR j=0 TO 31
380     j$=INKEY$(4,-1)
390     att=CODE (att_array$(j+1,i) DIV 8)+111
400     ik=att&7: paper=(att&56)/8
410     z=CODE (z$)
420     FOR k=7 TO 0 STEP -1
430       IF z MOD 2: THEN
440         BLOCK 2,1+(i MOD 3)*8,2+(j+8)*k,row,ik
450         ELSE
460         BLOCK 2,1+(i MOD 3)*8,2+(j+8)*k,row,paper
470         END IF
480         z=z DIV 2
490       END FOR k
500     END FOR j
510     row=row+(i MOD 3=0)
520 END FOR i
530 END DEFine PRINT_INK
540 :
600 DEFine PROCedure delay
610 LOCal x$,count,c$
620 x$="pixels": count=0
630 REPeat loop1
640   c$=INKEY$(4,-1)
650   IF c$=x$(count+1) THEN
660     count=count+1
670     ELSE : count=0
680     END IF
690     IF count=5 THEN EXIT loop1
700 END REPeat loop1
710 c$=INKEY$(4,-1)
720 END DEFine delay
```

Shock horror! A new QL game from Rubicon Systems.

Dragonhold
Rubicon Computer Systems
£19.95

Dragonhold

In the early days of computer programs there appeared several rather simple attempts at role playing D&D type games. None provided the sophistication and variety of action of the original game but they had charm and varying degrees of success. These developed in many ways into the games we now know and love on most machines. The QL however, never attracted the same degree of enthusiasm and ingenuity that programmers lavished on other machines.

Dragonhold has many features in common with these early games, but I must add that they have tried quite successfully to combine adventure and animation and strategy. The problem is that fans of each specific genre may find this hybrid unsatisfying. I just hope that there are enough 'all rounders' to buy, enjoy and make this a success.

The game is a traditional D&D type, you begin in the Dark Caverns and have to search for the Elixir of Life. There are six different areas and a host of creatures which react to you in different ways. You can attack or even talk to them if they are friendly.

Movement is achieved by cursor keys or joystick and is depicted graphically in the central window. Other windows provide information on status, text input, and messages, the graphics are made 4 graphics and though not stunning, are certainly adequate for the game.

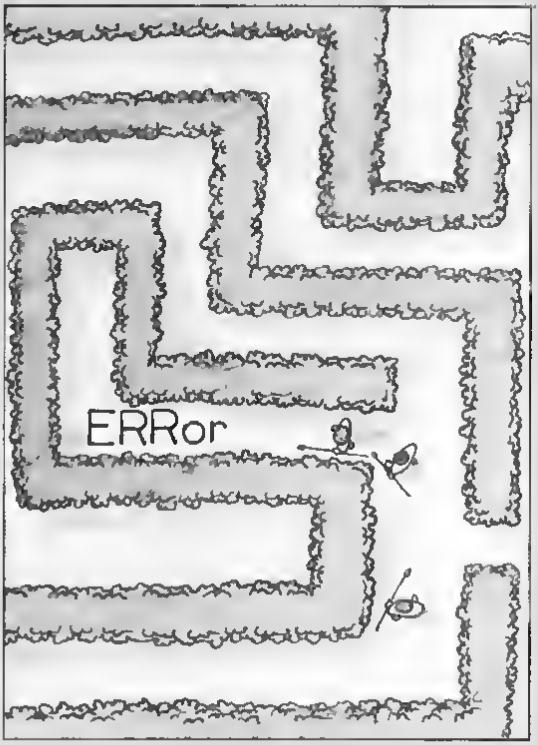
My greatest grievance against most arcade adventures is that there is usually no time to just sit and think. A Freeze option is supplied to allow this along with a full complement of save and load game options. The adventure elements are catered for in the most comprehensive system I have seen for this type of game, letter keys A to X have associated VERB or NOUN words to the extent of 11 verbs and 24 nouns. For instance, key 0 doubles as OPEN and OPAL. It means that adventure purists will find the joy of discovering the right words and the surprise of finding unknown objects has been eliminated. However when playing the game it adds greatly to the range of actions you can perform compared with a purely graphical program.

The ability to fight, converse and barter are all included and the options are very comprehensive. I found that its very lack of clever techniques, no icons, no multi key combination presses, added to its appeal and soon I had became completely absorbed in the problems, not mind bending, but enough to make you pause for thought.

I liked it, a pleasant change and surprisingly addictive.

QL ERROR TRAPPING

Mel Mackaron presents an invaluable aid for QL programmers — a simple and effective error trapping technique.



The Sinclair QL is a wonderful computer, and SuperBASIC is a very good programming language, but, for the person trying to use his QL to write a fairly professional application, there has, until now been a significant stumbling block: the 'absence' of an error-trapping command. Most micro-computers have a keyword combination such as ON ERR — GOTO xxx to help with controlling end-user errors or I/O errors. But nowhere in the Sinclair documentation, including the QL User Guide and the QL Technical Guide is there any mention of such an aid.

Ordinarily, the lack of such a command would not be a problem. If, in a utility you have written for yourself, an error occurs, you should know your program well enough to re-enter at a suitable point. But what about another user who does not have your knowledge of the program's structure? If he makes an error causing the program to terminate, he may not know how to get back in.

Ram Secrets

If you have faced this dilemma, you may have felt that you only had limited options: you could type a message to the user such as 'In case of an error, type "GOTO xxx" to re-enter the program'; you could attempt to learn assembly language well enough to write you own error-retrieval routines; you could give up. However, you do have a fourth option. Hidden in the QL's ROM (and not documented in the above-mentioned books) is the keyword combination **WNEN ERRor — RETRY — END WNEN**.

The concept behind **WHEN ERRor** is fundamentally the same as an ON ERR — GOTO statement, however, the syntax and coding are somewhat different. Nevertheless, once you

know how to use this tool, you will be able to give your program a more professional appearance.

When beginning work with **WHEN ERRor**, you must remember a couple of rules. First, do not try to exit from it by using a **GOTO**. This may cause unpredictable results later on, such as a message like 'error during WHEN processing'. Second, the **WHEN ERRor** routine needs to precede the point at which the error could occur. Also, if you are using separate **WHEN ERRor** routines, remember that the latest one takes precedence. Therefore, you must always keep in mind the user's location in the program so that the correct errors will be trapped.

The four sample program segments I have included show different levels of error trapping. In the fact, all we shall rely upon is that which is built into the computer. In the second, the programmer is protecting against anything except an I/O error. The third demonstrates a basic introduction to the **WHEN ERRor** construct. The fourth shows how you can trap for multiple errors within one routine. Within these segments, I have also tried to show a bit of what is generally termed 'accepted programming practice', something which may help you to improve your own programming.

Deliberate mistakes

All program segments rely upon two type of errors. First, we ask for a number to be entered. On the QL, if a string (such as 'hello') were entered instead of a number, you would get error -17 (error in expression). Then, we summon a directory of MDV2. If there were no cartridge in that drive, we would get error -7 (file or device not found). You should enter all listings (one at a time) and then RUN them. When you do run them, purposely make the errors you are testing for in that way you will learn how each trapping method works and how we are improving on the basic, machine-level trapping.

Listing One works only with machine-level control. In other words, when the computer encounters an error, program execution stops with an error message. You may then RUN the program again. While this method of detecting faults may be informative, it is also fairly primitive and frustrating, especially for the user who is not well-versed in the operation of computers.

Listing Two show what a reasonably competent programmer might do for error control. In this one, we are

Listing One

```
 10 REMark This program demonstrates programming with no
 20 REMark at error-trapping.  It relies solely on machine
 30 REMark level error reports.
 40 REMark
 50 MODE 0 : PAPER 0 : INK 7 : CLS : REMark Set Display
 60 INPUT 'Enter a Number:  ';num
 70 PRINT \'Your number was ' & num
 80 PRINT \'Press any key to continue...'
 90 PAUSE : REMark waits for a keypress
100 CLS
110 DIR MDV2_
120 PRINT \'Program successfully completed.'
130 STOP
```

Listing Two

```
 10 REMark This section demonstrates error-trapping efforts by
 20 REMark the programmer who does not use WHEN ERRor.  It
 30 REMark checks for correct user input, but cannot control
 40 REMark I/O errors efficiently.
 50 REMark
 60 MODE 0 : PAPER 0 : INK 7 : REMark Set Display
 70 CLS : INPUT 'Enter a Number:  ';num$
 80 REMark Input is as a string which coercion will convert to
 90 REMark a number.
100 IF num$ = '' : GO TO 70 : REMark User only pressed ENTER
110 IF num$(1) < '0' OR num$(1) > '9' : GO TO 70
120 REMark User did not enter a number
130 num = num$ : REMark Correct entry, so convert it
140 PRINT \'Your number was ' & num
150 carry_on
160 CLS
170 PRINT 'Following is a directory of MDV2'
180 PRINT \'If you get an error, type "GOTO 180"'
190 carry_on
200 DIR MDV2_
210 PRINT \\'Program successfully completed'
220 STOP
230 DEFine PROCedure carry_on
240   REMark merely a routine to wait for a keypress
250   PRINT \'Press any key to continue...'
260   PAUSE
270 END DEFine carry_on
```

Listing Three

```
 10 REMark This program introduces WHEN ERRor.  If an error
 20 REMark occurs, the user is returned to that line number
 30 REMark to try again.
 40 REMark Procedures are heavily used to make flow of program
 50 REMark clearer.
 60 REMark
 70 initialise
 80 enter_num
 90 directory
100 PRINT \\'Program successfully completed.'
110 STOP
120 DEFine PROCedure initialise
130   MODE 0 : PAPER 0 : INK 7 : REMark Set Display
140 END DEFine initialise
150 DEFine PROCedure enter_num
160   WHEN ERRor
170     PRINT \'INVALID ENTRY'  (Must be a NUMBER)'
180     carry_on
190     CLS
200     RETRY : REMark Return to site of error.  Try again. ▶▶
```

```
210   END WHEN
220   CLS
230   INPUT 'Enter a Number:  ';num
240   PRINT \'Your number was ' & num
250   carry_on
260 END DEFine enter_number
270 DEFine PROCedure directory
280   WHEN ERRor
290     PRINT \'Microdrive ERROR.'
300     PRINT 'Place a program cartridge in MDV2'
310     carry_on
320     CLS : RETRY
330   END WHEN
340   DIR MDV2_
350 END DEFine directory
360 DEFine PROCedure carry_on
370   PRINT \'Press any key to continue...'
380   PAUSE
390 END DEFine carry_on
```

Listing Four

```
10 REMark This program allows the programmer to direct program
20 REMark execution from only one WHEN ERRor routine.  It
30 REMark accomplishes this by PEEKing the QL's BASIC VARIABLE
40 REMark area to discover the error number.
50 REMark
60 WHEN ERRor
70   REMark a little bell to alert the user
80   BEEP 2000,12 : PAUSE 5
90   BEEP 2000,6  : PAUSE 5
100  BEEP 2000,9  : PAUSE 5
110  errnum = PEEK_L(PEEK_L(163856) + 298)
120  SELect ON errnum
130    = -17
140      PRINT \'INVALID ENTRY'  (Must be a NUMBER)'
150      carry_on
160      at x,y : CLS 4 : CLS 2
170      REMark Reset cursor; clear screen
180      RETRY
190    = -7
200      PRINT \'ERROR at MDV2!'
210      PRINT 'Place a PROGRAM cartridge in MDV2'
220      carry_on
230      CLS : RETRY
240  END SELect
250 END WHEN : REMark Don't forget this line.  It's VITAL.
260 initialise
270 enter_num
280 directory
290 PRINT \\'Program successfully completed.'
300 PRINT 'You are now an expert error-trapper''
310 STOP
320 DEFine PROCedure initialise
330   MODE 0 : PAPER 0 : INK 7
340 END DEFINE initialise
350 DEFine PROCedure enter_num
360   CLS
370     = 0 : y = 16 : REMark variables to hold cursor position
380   PRINT 'Enter a Number: ';
390   INPUT num
400   PRINT \'Your number was ' & num
410   carry_on
420 END DEFine enter_num
430 DEFine PROCedure directory
440   CLS
450   PRINT 'Following is a directory of MDV2'\\
460   DIR MDV2_
470 END DEFine directory
480 DEFine PROCedure carry_on
490   PRINT \'Press any key to continue...'
500   PAUSE
510 END DEFine carry_on
```

trapping within the program against a user entering a string instead of a number. However, as we have no control over I/O errors (such as 'format failed'), we only include a statement to the user telling him how to re-enter the program.

Listing Three is our first introduction to **WHEN ERRor**. It will handle any type of error, and its only drawback is that we must include a **WHEN ERRor** routine at the beginning of each procedure. (I have included procedures here to demonstrate the clarity and modularity you gain from using these in your program.) Because the computer knows an error has occured (and which error it was), the **RETRY** command returns you to the specific line at which the mistake happened and re-executes from there.

Finally, in Listing Four we shall see how to PEEK the system variables on the QL to find the specific error code which was generated. By so doing, we can write just one error trapping routine, one which will give a different result depending upon the code it receives. Finding the correct code works in this way: First, we must locate the base of the SuperBASIC area.

In the QL this is not fixed, as it is in many other micros. Therefore, we find it by PEEKing memory location 28010h (163856 in decimal). The base of SuperBASIC is held as a 'long word', so we will use PEEK_L for this. The header associated with the SuperBASIC 'job' is 104 bytes (decimal) long, and we must add this to the start address. Last, we add the vector which points to the error code (BV_ERROR), which is 194 bytes (decimal) long, and PEEK the resulting address. This variable, too, is a 'long word', requiring us to again use PEEK_L. (Sounds complicated, doesn't it? But it isn't.) The formula for getting the error number is PEEK_L(PEEK_L(163856) + 298). Once we have this, it is quite simple to write a comprehensive block of code to trap our errors.

As a last note about **WHEN ERRor** you should not think of it as providing copy protection for your programs. It does not recognise (CTRL)-(SPACE) (i.e. BREAK) as an error. Therefore, your program listings will be available to anyone who may be interested in them. However, if you force a program BREAK while an error is being processed, you may find yourself getting unpredictable (and unwanted) results at a later time.

Armed with an understanding of the QL's **WHEN ERRor** keyword and its syntax, you should now find that, while it is perfectly human to ERR, you will not be unduly punished for your mistakes.

Time to enter our competition and win yourself a Gremlin clock.

OK, take the flying ducks off the wall. We've got something much better for you, something that will become the aesthetic centrepiece of any front room and wouldn't look out of place in Fergie and Andy's new place (in fact, I'm told that they wanted one as a wedding present but these things aren't easy to come by)

What is it? What else but a high-tech, technicolour Gremlin clock! We've gotten together with the guys at Gremlin to offer five of these clocks as prizes to ZX readers, and for ten additional runners up there are copies of Gremlin's latest game, the mega-addictive Trailblazer, to be won

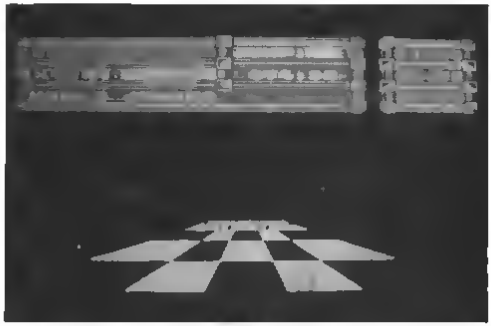
Anagrams

All you have to do to become the proud owner of one of these chronometric classics is to take the name of any Gremlin game, and see if you can come up with an interesting anagram made up out of that name. For instance, you could take Way of The Tiger and turn it into TOO FEW GET HAIRY (except that I cheated and made up an extra 'o', but you get the idea)

Just to get you started here are the names of a few Gremlin releases that you could use:
Monty on The Run
Jack The Nipper
Trailblazer
Way of The Tiger
Bounder

Once you've come up with an anagram, fill in the coupon on this page, and also write your anagram on the back of the envelope then send it to Gremlin Competition, ZX Computing Monthly 1 Golden Square, London W1R 3AB.

Entries must arrive by first post on the 5th December 1985 This competition is open to all readers of ZX Computing Monthly, except employees of Argus Specialist Publications, Gremlin Graphics and Alabaster Passmore and Sons.



Trailblazer

COMPETITION

Gremlin Competition

Game Title .....

Wacky anagram .....

Name .....

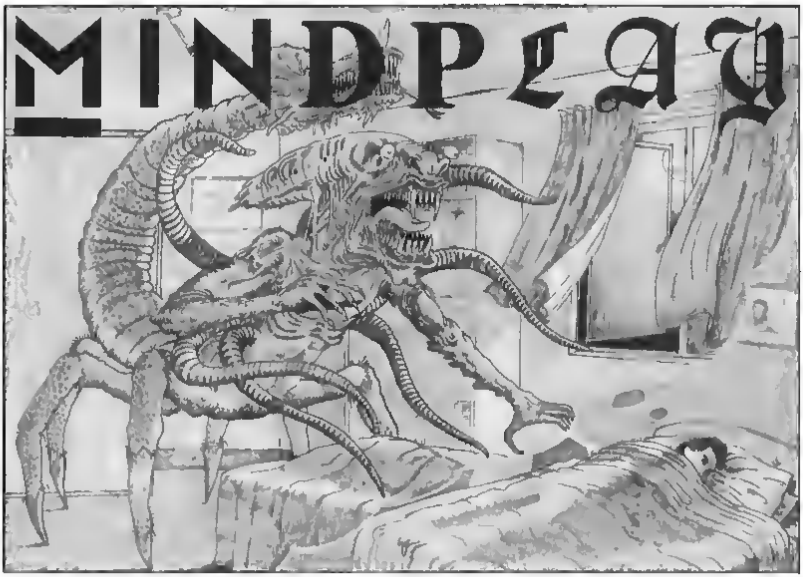
Address .....

.....

.....

Send your entry to Gremlin Competition, ZX Computing Monthly 1 Golden Square, London W1R 3AB. Entries to arrive by 5th December 1986

MINDPLAY



Do you know the latest evil plan hatched from Barbaric Bryan's hideously warped mind? Not content with locking me in this dark, damp and dismal dungeon, not content with cold custard torture,, not content even with showing "The Price Is Right" on an out of reach video screen, 24 hours a day, he resorts to trying to ruin my macho image. I of course, receive bulging bags of fan letters each day (I know they come, he just refuses to show them to me due to insane jealousy) The affront I am referring to is the "artwork" in the September issue. This portrayed my as having a concordian nose, and, in the drawing of a hand reaching out the grating, long, manicured and painted fingernails! But let my assure you reader, in reality I combine the best features of Mat Dillon and Richard Gere Admittedly the nails are longish, but I have been down here for three years and I certainly don't paint them After all, how could I get to Boots? And if I did theyd probably be right out of my shade of pink

Snappy titles this month: HRH, Zzzz, and Moron (thankfully we did Journey To The Centre Of Eddie Smith's Head last month — it would have ruined the continuity) And yonks after the Commodore version, Level 9's Jewels of Darkness has finally arrived for the Spectrum

In last month's review of products from Interceptor's budget label Players, I said that far better than pushing out those poor games would be to re-release some of the old Interceptor adventures. I'm glad to say that this is being done (not as a result of my comments, but who cares?) You can now buy Heroes Of Karn, Warlords and Jewels of Babylon amongst others for £1 99, a price they are ikeally suited to This is because they are all marred by a poor vocabulary and pretty brief text They do have some beautiful graphics though and fun problems, plus often a level of difficulty suitable for beginners, which is quite rare these days. They're minor classics and no adventurers collection should be without at least one of such a price. If you cannot find them in the shops for so little, send for details from Interceptor at Mercury House, Calleva Park Industrial Estate Aldermaston, Berks RG7 4QW

News of adventure organisations continually comes my way The Spectrum Adventure Exchange Club I mentioned in August is still going strong and the same people now run Spectrum Adventurer, a tape magazine which costs two pounds. I looked at issue four and was quite impressed There are reviews of less well known products, which tend to be ignored by most magazines, a well written help section, an entertaining column by none other than John Wilson (under a pseudonym), plus other bits and bobs. The magazine text is large and attractive. You also get part of a serialised adventure, which, although dealing with the hackneyed science fiction theme, seemed above average with some well written description (no graphics), certainly a keen adventurer could while away an enjoyable hour or two with it

The main fault with the tape is that the magazine parts make little use of the computer medium These is no index system and your are forced to flick through every page rather than choose a review, for example A Ceefax style selection, or better still menu driven choices at the bottom of the screen would greatly improve the product

That said, Spectrum Adventurer is a good buy for the adventure nut, less devoted players won't find it as much fun With enough reader support, it could become a very worthy mag indeed, and I hope they rectify the fault I mentioned (easily done) Write for more details to 4 Kilmartin Lane, Carluke, Lanarkshire ML8 5RT

Roger Garret's Adventureline is apparently ending soon, though I haven't heard officially Questionline is still going strong though, and all adventure clubs must watch out — because Tony Treadwell is starting a new, commercial adventure only magazine soon

But enough of these deranged ramblings ... let the reviewing begin!

HRH
8th Day
£8.95

Whilst I'm not a great advocate of censorship, some of this game is of dubious taste and parents may feel that their children need protecting from its 'adult' humour but providing you are not easily offended, I think you'll love this. HRH is the most biting computer satire since Denis Through The Drinking Glass, this time the subject matter is (mostly) our royal family, and the irreverance is limitless.

You are horrified when your eagerly awaited DHSS envelope contains someone elses giro then you notice the name and address. It belongs to Queen Elizabeth. And if you have hers — she must have yours! How will she afford the Queen Mother's meals on wheels on such a small sum? Will she have to sell the corgis to MacDonalds? What about her Oxfam clothing bill ? Theres nothing for it but to return her giro personally.

You start in a post office, next to Princess Di waiting for her family allowance, and Prince William who is impersonating his father with a pair of huge rubber ears. Close by are further royals and before the end of the game you will have met the whole clan, on your travels around London. Their personalities will be familiar to all Spitting Image fans, drunken Margaret Greek Phillip, stupid Edward and randy Andy who provides many of those "adult" jokes I mentioned.

The humour itself is also along Spitting Image lines some crude, some more subtle. I won't spoil the fun by giving too much away but I particularly liked Madame Tussauds, where pride of place in both the Chamber Of Horrors and the Gallery Of Famous Murderers is taken by Margaret Thatcher. Later you face the gruesome task of impersonating her, yet when doing so, you won't be allowed into the palace!

Description is lengthy, entertaining and well written, and characters wander round in convincingly independent fashion. There are a few fairly average split screen graphics.

An incredible amount has been packed into this Quilted game, not just text but many special messages and amazing complexity. While this is no fault some of the commands — particularly EXAMINE — have had their responsiveness sacrificed in order to fit everything in. Despite this misgiving, HRH is technically very sound. Vocabulary is adequate, but at a few points too obscure. Coming from a small company I was pleasantly surprised at the skillful presentation. The actual game has polished appearance, RAM SAVE/LOAD is included and the packaging competes with many of the software big boys. My only major gripe is that this is a pound or two overpriced for a mail order product.

The actual adventure isn't quite up to Monster Hit standard. However I had so much fun playing HRH, and its shees originality and energy comes as such a welcome breath of fresh air in the face of countless middle earth games from Level 9 et al, that I've given one anyway. 8th Day are a company to watch.

I sincerely hope they reach a distribution deal to get HRH into the shops, but in the meantime write to 18 Flaxhill, Moreton, Wirral, Merseyside L46 7UH.

```
You are outside a Unique loo
(apparently they're all the rage
on the Continent). A huge crowd
of screaming kids block the way
south to a pavement cafe, and
which an unofficial path leads
southeast. The loo is west.

What Next?
S
Crowds of children block you..

What Next?
W
A park warden stops you- "OUT OF
ORDER!"

What Next?
SCORE

   You have scored 15 from a
        possible 200.
```

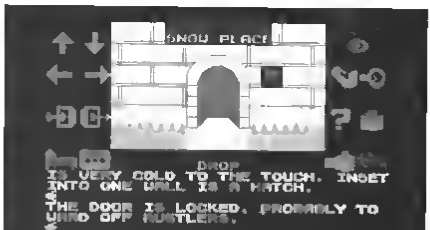
MONSTER HITS

Zzzz
Masteritronic
£1.99

You are trapped in your dream and must awake. Though this game is more likely to have sent you to sleep in the first place. Dreaming could be the theme for an excellent adventure, but Zzzz fails because instead of capturing the weird nocturnal atmosphere or outrageous imagination of the best dreams, the authors have used the scenario as an excuse to fling together random and uninspired ideas. Also lacking is the warped logic which makes the wildest dreams feel continuous.

And Zzzz has many other faults, which is a shame because there are some good ideas. The best of these is the presence of icons replacing common commands (directions, GET/DROP etc.) while text input is retained for rarer words. Unfortunately, a massive bug means these have a life of their own and automatically select random commands, even while you are typing, making the game virtually unplayable. Furthermore, the delete key won't function as it's used for icon selection. John Wilson tells me that these faults disappear if a joystick interface is plugged in, but this is not mentioned in the instructions. Besides, there should be no need. The instructions are dreadful by the way, picturing non existent icons — they were written for the CSM version.

The non-icon vocabulary is small, and you are required to enter ridiculously obscure commands like THUMB A LIFT. Examine is usually unresponsive. The text is reasonable but some of the graphics are pathetic. The whole thing is horribly unfriendly and not worth your time or money.



GRIM

MORON
Atlantis
£1.99

Following the Marie Celeste earlier in the year another science-fiction game from Atlantis, which also includes elements of time travel — killing two adventure cliches with one stone? Particularly stupid aliens called — you've guessed it — morons, stumble across the Pillars Of Time and promptly lose them in their spaceship. Said vessel is now on collision course with earth so you have a limited time to fulfill your task, which naturally is to collect the pillars and save the world.

Quilled and Patched Moron offers split screen graphics at nearly all the numberous locations, quite a feat given the memory limitations. These are attractive enough but look incredibly similar, even though there are subtle differences. Then again, I suppose a large spaceship would appear somewhat monotonous.

To fit them all in the text had to be sacrificed or perhaps massacred would be more appropriate. There is not description at all, just a location title like 'The Teleport Room'. There are many objects lying around, which compensates a little, but purists should avoid. Vocabulary is strict but not awful.

I've said before that science-fiction games tend to bore me, and Moron has nothing new to offer. However some of the problems here might while away the odd hour though what I've seen strikes me as too easy for expert adventurers.

Moron is not a bad effort but strikes me as amazingly average, nothing new or notable. If there's nothing better around then this is no rip-off but neither is it a must buy.

GOOD

ADVENTURE

HELPLINE

Some help for David McCallum (not Illya Kuryakin himself, surely?), who's still stranded in sunny **Terrormolinos.** The correct hotel to go to is found by reading the brochure. Once in your room, drop your clothes, get and wear the trunks, then take, knot and wear the hanky. Suitably equipped with camera, snorkel and harpoon gun you'll be ready to start your holiday proper.

Meanwhile, back in Middle Earth, Michael Payne is troubled by trolls. The game is **The Nobbit,** naturellement. To kill the trolls and get the key, you must wait until dawn (i.e. keep typing WAIT until the program tell you it's light). However, you must do this when somewhere else, like the nearby path — otherwise it's boiled Michael on the trolls' menu.

In the decidedly more muddled world of **The Boggit,** the trolls are less easily dealt with — I suggest you listen very carefully to what the theologist says, then scour the washing powder shelves of your local supermarket. But before that, Stephen Page of Romford cannot escape his hole. He has found the diary (CLIMB CHEST for those who haven't) but cannot find the word combination to open the door. Turns out you were using the wrong birthday Steve: type Fardos in!

Kris Daryani from Middlesex is struggling in an earlier satirical escapade of Fergus McNeill, **Bored Of The Rings.** He cannot find the poster of Rocky to give to the gay monsters. Well, starting by the pixie enter the maze by going East. Then E, N, E, E, S, W, S, E, GET POSTER, W, W, S, W. But don't hang around too long.

Mitchell Blower writes about **Sorceror Of Claymourge Castle.** "How do you find the towel and how do you enter the castle without the seed spell?" he asks, referring to hints in a previous issue. The moat answers both questions. From nearby, GO MOAT. Obviously you must HOLD BREATH, before you SWIM DOWN, TAKE TOWEL, SWIM DOWN, SWIM FAST, and SWIM UP. You will now be in the castle, and can save the seed spell for opening a stone door, later. The moat will need a further visit, with a deep treasure dive that can only be survived by escaping with the Bliss spell.

David Heron from Perston has an (old style) 128 and is stuck late on in **Never Ending Story.** "How can I reach the top of the Ivory Tower, I keep going round in circles" That's because you are in a maze, Dave. The route through is like this: from the bottom of the main stairs go U, E, E, NE, U, W and W, where you will find some completely useless treasure, then W, SE, U, E, E, E, U to find the door. Just be polite and the game is near finished. The cape you have found has no use. And in response to a steady stream of enquiries, it is not possible or necessary to enter the Ivory Tower in part one.

Some more information about **Denis Through The Drinking Glass.** When I gave some hints a couple of months back, I may have misled you into exitting by the window first. In fact you need to journey out the front door to start with. Make sure you are wearing your suit, and carrying the letter (which you must hand in at the Private Eye offices), the Cherry Blossom (for dealing with Norman Fowler) and your teeth (from the tumbler in the bathroom). The gnashers should be worn in time to SMILE at the photographers. Before you leave for the first time, collect all the items you can and leave them in your room, as Maggie will lock you in on your return. BUY TICKETS from the copper in the road then head NE.

Thanks as usual to the help of Rochdale's John Wilson.

Help The Helpline

The helpline has been running over six months now, and in that time I must admit (though not too loudly, otherwise Bryan will whip me even harder) that some problems have come in which even I cannot solve. Now it is an undeniable fact that ZX readers are the most intelligent beings in the entire universe, so I call on you to do a good deed and help your fellow creature. Please, please, please help. Please ... (I think we get the gist. Ed)

What I want you to do is fill in the "I can help solve" part of the coupon if you have completed any of the following games: **Eureka (Roman), Runes Of Zendos, Dragonworld, The Secret Of St. Brides, The Pawn, Smugglers Cove, The Mansby Jewels, Castle Colditz (K-Tel), Aksheron, Castle Blackstar** or **Return To Ithaca.** With a few exceptions those are rather obscure, but someone out there must have played them. If you have just put the coupon in an envelope and I'll be in touch for help from you! Obviously an SAE is not needed in this case, and I'll be happy to give you any help in return.

Write to me

Whether you're stumped by Seabase Delta, harassed by Hunchback or bamboozled by The Boggit, we can help. Fill in the coupon and send it to: Mindplay Helpline, Deepest Dampest Darkest Dungeons, ZX Computing, No. 1 Golden Square, London W1R 3AB.

A few rules: British correspondents, please enclose a stamped, addressed envelope if you want a personal reply rather than wait for the magazine to come out. If you are writing from abroad, just enclose an envelope — I'll add the postage. I try to respond within two months but I can take longer (on the other hand, you might receive an immediate reply). I ONLY DEAL WITH ADVENTURES. Not arcade games, nor technical problems (write to Crosswires about those). I'm not too hot on adventures these days (Gargoyle games included). Finally, please write the name of the game you're writing about on the back of the envelope.

Another month's missive must draw to a close, but fret not, for I'll still be here next issue. Or will Bryan succeed in his twisted plans to bump me off? Or will I succeed in my twisted plans to bump Bryan off? There's only one way to find out — read Mindplay next month!

Title

Company

Problem

I can help solve

Name

Address

VENTURESPEAK

Part 2: Alan Davis' adventure series looks at command analysis.

This month brings you the second part of the VENTURESPEAK machine code program, and we'll be taking a look at the gentle art of "parsing the input" — or "command analysis", if you prefer.

You're going to need the machine code keyboard routine that you saved last month, as we need to patch this month's program onto it to produce a single block of code. Listing 1 is the assembly language program for the "parser" — this is the program which will scan through a typed input, checking the words against a set of vocabulary data. As you can see, it's a fairly lengthy routine so an assembler will make error-free entry considerably easier — but if you don't have an assembler all is not lost, since I've given a decimal dump of the code in Listing 2. All you need to do is type in Listing 3, RUN it, and then enter the numbers from Listing 2 in order, including the checksums after every fifth byte. Take things slowly, checking the screen display against the listing as you go along, and all should be well. When you've finished, the program will save the code to tape for you as "PARSER" CODE 60400, 750.

Parsing

So far, so good. We now need to weld the keyboard and parser sections together as follows:

1) Reset the Spectrum using **RANDOMISE USR 0.**
2) Enter **CLEAR 59999** as a direct command.
3) Load in the keyboard code you saved last month **(LOAD "KEYBOARD" CODE).**
4) Load in this month's parser code **(LOAD "PARSER" CODE).**
5) Now save the whole lot as a single block with **SAVE "V-SPEAK" CODE 60000,1150** — and keep it safe somewhere until next month.

In addition to this single code block, it's probably wise to keep the two separate parts as well for the present, to facilitate checking in case you discover errors later.

Of course you'll be wanting to know just what this new routine does, and to test it out. We'll certainly be looking at how it works in this article, but as for testing it — well, I'm going to ask you to be patient and wait until next month. You see, the problem is that our parser is actually fairly useless at present, because it doesn't yet possess a vocabulary! (Rather like a chap who, though highly intelligent, has no background knowledge to draw upon ...) To put vocabulary into the parser we'll need the VENTURESPEAK EDITOR — and that's our task for next month.

For the present though, I'm going to explain the basic principles underlying the parsing system so that when the time comes for you to use it, you'll be familiar with all the main features. We can't discuss this in a vacuum, so in Figure 1 I've given a very elementary vocabulary of words which you might expect to find in a typical adventure (printed out from the EDITOR program, in fact). Figure 1 itself raises a few points which need to be mentioned before we go any further.

1) Only the first three letters of any word are significant. (This can occasionally give rise to some confusion because the parser can't distinguish between words such as "RAVEN" or "RAVINE", although in practice I've never found this to be a serious problem, myself. My game "RUNESTONE" uses only

three-letter parsing)
2) Vocabulary is divided into three distinct types: VERBS, OBJECTS and PEOPLE. This has advantages over the usual simpler subdivision into VERBS and NOUNS because it helps the error-trapping process when you write your adventure, as you'll see later
3) Each item of vocabulary is assigned a number between 1 and 254 inclusive. Synonyms are catered for by assigning the same number to different words, so that the verbs SAY, TELL, ASK, and TALK, for example, are all assigned the number 1. This is a good place to make an **IMPORTANT NOTE**: generally you can assign any number you like to any verb you like, BUT IT IS ESSENTIAL THAT ALL VERBS IMPLYING SPEECH BE ASSIGNED THE NUMBER 1 if the parser routine is to work correctly

Input

In practice what happens will go something like this. Your BASIC adventure program will invite input from the player by invoking the keyboard routine: LET M=USR 60000. The player then types in his command, presses ENTER when he's finished, and the routine returns to BASIC having stored the player's input as a string of bytes in the correct addresses above RAMTOP. We now want the parser to scan this stored command and decode it, so the next step is to call the parser routine with LET M=USR 60400. The parser now scans through the player's command, character by character, checking the words it finds against those in its vocabulary, ignoring any words it fails to recognise and skipping on to the next. It eventually stops, either when it reaches the end, or when it reaches a comma, full stop or the word 'AND' (these last items signifying that the player has typed in several commands at one go) and returns to BASIC.

The parser having done its job (almost instantaneously of course), we need to extract the fruits of its labours by PEEKing certain addresses. It makes for an easier life if the results of these PEEKs are assigned immediately to BASIC variables with suitably memory-jogging names, like this:

```
LET TELL=PEEK 61124
LET PERS=PEEK 61125
LET VB1=PEEK 61126
LET VB2=PEEK 61127
LET FK1=PEEK 61129
LET OB1=PEEK 61131
LET OB2=PEEK 61132
LET MORE=PEEK 61123
```

What this all amounts to is that you can extract from any one command the code numbers for up to three verbs, two objects, and two people — so that your BASIC program can then perform the necessary condition tests appropriate to your adventure. A few examples should make things clear

Figure 1 Vocabulary list, with each verb, noun and object individually numbered

VERBS							
		O	10		SHI	5
		OON	10		ABM	6
SAY	1	OES	10		BOO	7
TEL	1	GET	11		CHE	8
ASK	1	TAK	11		BOX	9
TAL	1	PIC	11		DOO	10
L	2	OAD	12			
LOO	2	PUT	12		PEOPLE	
H	3	EXA	13			
HOA	3	REA	13		SAM	1
S	4	GIV	14		FRE	2
SOU	4	OFF	14		PET	3
E	5	FIG	15		JOH	4
EAS	5	KIL	15		JOE	5
W	6	ATT	15		JOE	6
WES	6	HIT	15			
IN	7					
EXIT	7					
OUT	8	OBJECTS				
LEA	8					
U	9	SWO	1			
UP	9	DAG	2			
CLI	9	SPE	3			
ASC	9	KNI	4			

Figure 2 Examples of command analysis

```
EXAMINE THE DAGGER                PUT THE BOOK IN THE CHEST

        A                                 C

  COMMAND ANALYSIS                  COMMAND ANALYSIS

TELL      0                       TELL      0
PERS      0                       PERS      0

VB1      13                       VB1      12
VB2       0                       VB2       7

FK1       0                       FK1       0

OB1       2                       OB1       7
OB2       0                       OB2       8

        B                                 D

   SAY TO FRED                     ASK PETER TO GIVE
"EXAMINE THE DAGGER"               THE KNIFE TO JOHN

  COMMAND ANALYSIS                  COMMAND ANALYSIS

TELL      1                       TELL      1
PERS      0                       PERS      3

VB1      13                       VB1      14
VB2       0                       VB2       0

FK1       0                       FK1       4

OB1       2                       OB1       4
OB2       0                       OB2       0
```

Examining

Figure 2 gives examples of the analysis of a range of commands involving the basic vocabulary of Figure 1. (You might like to know that these figures are all screen dumps from the VENTURESPEAK EDITOR in "test" mode). Let's start with the first and simplest command — 2(a): "EXAMINE THE DAGGER". Only two words are really relevant here — the verb "EXAMINE", and the noun (in this case an object) "DAGGER". You'll see in the example that the parser has assigned the value 13 to VB1, 2 to OB1, and zero to everything else. Now look back at the vocabulary list in Figure 1, where you'll find that verb number 13 is 'EXA' (for "examine"), and that object number 2 is 'DAG' (for "dagger"). Makes sense? OK, then let's try something a little more complex

The second example, Figure 2(b), shows the analysis of the command "SAY TO FRED "EXAMINE THE DAGGER" " and we find VB1 and OB1 assigned just the same values as before (as we'd expect) but look: this time the variable TELL takes the value 1 (signifying speech) and the

Listing 1

Assembly language program

```
*HISOFT GENS3M2 ASSEMBLER*
        ZX SPECTRUM

Copyright (C) HISOFT 1983,4
All rights reserved

Pass 1 errors: 00

                     10 *D+
        20 *C-
        30 PARSER
60400   40        ORG  60400
60400   50 INIT   LD   HL,START
60403   60        LD   (NCOM),HL
60406   70        LD   (PTR),HL
60409   80        LD   A,(COUNT)
60412   90        LD   E,A
60413  100        LD   D,0
60415  110        ADD  HL,DE
60416  120        LD   A,255
60418  130        LD   (HL),A
60419  140        XOR  A
60420  150        LD   (TELL),A
60423  160        LD   (PERS),A
60426  170 RESIZE SUB  A
60427  180        LD   (UB1),A
60430  190        LD   (UB2),A
60433  200        LD   (UB3),A
60436  210        LD   (FK1),A
60439  220        LD   (FK2),A
60442  230        LD   (OB1),A
60445  240        LD   (OB2),A
60448  250        CALL COMMA
60451  260 LOOPA  LD   HL,(PTR)
60454  270        XOR  A
60455  280        LD   (EXIT),A
60458  290        CALL FILTER
60461  300        LD   A,(EXIT)
60464  310        CP   1
60466  320        JP   Z,SOB1
60469  330        LD   HL,(PTR)
60472  340        LD   A,(HL)
60473  350        CP   255
60475  360        JP   Z,SOB1
60478  370        CP   44
60480  380        JP   Z,END
60483  390        CP   46
60485  400        JP   Z,END
60488  410        JP   LOOPA
60491  420 END    INC  HL
60492  430        LD   (PTR),HL
60495  440 SOB1   LD   A,(UB1)
60498  450        CP   1
60500  460        CALL Z,SWAP
60503  470        RET
60504  480 SWAP   LD   (TELL),A
60507  490        LD   A,(UB2)
60510  500        LD   (UB1),A
60513  510        LD   A,(UB3)
60516  520        LD   (UB2),A
60519  530        LD   A,(FK1)
60522  540        LD   (PERS),A
60525  550        LD   A,(FK2)
60528  560        LD   (FK1),A
60531  570        RET
60532  580 COMMA  LD   HL,(NCOM)
60535  590 LOOP   LD   A,(HL)
60536  600        CP   255
60538  610        JP   Z,ENDCOM
60541  620        CP   44
60543  630        JP   Z,SETCOM
60546  640        CP   46
60548  650        JP   Z,SETCOM
60551  660        INC  HL
60552  670        JP   LOOP
60555  680 SETCOM INC  HL
60556  690        LD   (NCOM),HL
60559  700        LD   A,1
60561  710        LD   (MORE),A
60564  720        RET
60565  730 ENDCOM XOR  A
60566  740        LD   (MORE),A
60569  750        RET
60570  760 FILTER LD   A,(HL)
60571  770        CP   39
60573  780        CALL Z,SKIPSP
60576  790        CP   32
60578  800        CALL Z,SKIPSP
60581  810        CP   58
60583  820        CALL Z,SKIPSP
60586  830        CP   255
60588  840        RET  Z
60589  850        CP   44
60591  860        RET  Z
60592  870        CP   46
60594  880        RET  Z
60595  890        INC  HL
60596  900        LD   A,(HL)
60597  910        CP   39
60599  920        JP   Z,SINGLE
60602  930        CP   58
60604  940        JP   Z,SINGLE
60607  950        CP   44
60609  960        JP   Z,SINGLE
60612  970        CP   46
60614  980        JP   Z,SINGLE
60617  990        CP   34
60619 1000        JP   Z,SINGLE
60622 1010        CP   255
60624 1020        JP   Z,SINGLE
60627 1030        INC  HL
60628 1040        LD   A,(HL)
60629 1050        CP   32
60631 1060        JP   Z,DOUBLE
60634 1070        CP   44
60636 1080        JP   Z,DOUBLE
60639 1090        CP   46
60641 1100        JP   Z,DOUBLE
60644 1110        CP   34
60646 1120        JP   Z,DOUBLE
60649 1130        CP   58
60651 1140        JP   Z,DOUBLE
60654 1150        CP   255
60656 1160        JP   Z,DOUBLE
60659 1170        JP   TRIPLE
60662 1180 SKIPSP INC  HL
60663 1190        LD   A,(HL)
60664 1200        CP   32
60666 1210        JP   Z,SKIPSP
60669 1220        CP   34
60671 1230        JP   Z,SKIPSP
60674 1240        CP   58
60676 1250        JP   Z,SKIPSP
60679 1260        LD   (PTR),HL
60682 1270        RET
60683 1280 SINGLE LD   HL,(PTR)
60686 1290        LD   A,(HL)
60687 1300        CALL SETPTR
60690 1310        LD   DE,(UCSG)
60694 1320        LD   B,A
60695 1330 LOOP1  LD   A,(DE)
60696 1340        CP   255
60698 1350        RET  Z
60699 1360        LD   (TPNO),A
60702 1370        INC  DE
60703 1380        LD   A,(DE)
60704 1390        CP   B
60705 1400        JP   Z,UBFWD
60708 1410        INC  DE
60709 1420        JP   LOOP1
60712 1430 DOUBLE LD   HL,(PTR)
60715 1440        LD   A,(HL)
60716 1450        LD   DE,(UCVD)
60720 1460        LD   B,A
60721 1470        INC  HL
60722 1480        LD   A,(HL)
60723 1490        LD   C,A
60724 1500        CALL SETPTR
60727 1510 LOOP2  LD   A,(DE)
60728 1520        CP   255
60730 1530        RET  Z
60731 1540        LD   (TPNO),A
60734 1550        INC  DE
60735 1560        LD   A,(DE)
60736 1570        LD   H,A
60737 1580        INC  DE
60738 1590        LD   A,(DE)
60739 1600        LD   L,A
60740 1610        LD   A,B
60741 1620        CP   H
60742 1630        JP   Z,FWD1
60745 1640        INC  DE
60746 1650        JP   LOOP2
60749 1660 FWD1   LD   A,C
60750 1670        CP   L
60751 1680        JP   Z,UBFWD
60754 1690        INC  DE
60755 1700        JP   LOOP2
60758 1710 UBFWD  LD   A,(UB1)
60761 1720        CP   0
60763 1730        JP   NZ,UB1DWN
60766 1740        LD   A,(TPNO)
60769 1750        LD   (UB1),A
60772 1760        RET
60773 1770 UB1DWN LD   A,(UB2)
60776 1780        CP   0
60778 1790        JP   NZ,UB2DWN
60781 1800        LD   A,(TPNO)
60784 1810        LD   (UB2),A
60787 1820        RET
60788 1830 UB2DWN LD   A,(UB3)
60791 1840        CP   0
60793 1850        RET  NZ
60794 1860        LD   A,(TPNO)
60797 1870        LD   (UB3),A
60800 1880        RET
60801 1890 SETPTR INC  HL
60802 1900        PUSH AF
60803 1910 LOOP3  LD   A,(HL)
60804 1920        CP   32
60806 1930        JP   Z,NEWWD
60809 1940        CP   34
60811 1950        JP   Z,NEWWD
60814 1960        CP   39
60816 1970        JP   Z,NEWWD
60819 1980        CP   255
60821 1990        JP   Z,LAST
60824 2000        CP   44
60826 2010        JP   Z,LAST
60829 2020        CP   46
60831 2030        JP   Z,LAST
60834 2040        INC  HL
60835 2050        JP   LOOP3
60838 2060 NEWWD  INC  HL
60839 2070 LAST   LD   (PTR),HL
60842 2080        POP  AF
60843 2090        RET
60844 2100 TRIPLE LD   HL,(PTR)
60847 2110        LD   A,(HL)
60848 2120        CALL AND
60851 2130        CP   1
60853 2140        RET  Z
60854 2150        LD   HL,(PTR)
60857 2160        LD   A,(HL)
60858 2170        LD   (CHAR1),A
60861 2180        INC  HL
60862 2190        LD   A,(HL)
60863 2200        LD   (CHAR2),A
60866 2210        INC  HL
60867 2220        LD   A,(HL)
60868 2230        LD   (CHAR3),A
60871 2240        CALL SETPTR
60874 2250        LD   DE,(UCVS)
60878 2260 LOOP5  LD   A,(DE)
60879 2270        CP   255
60881 2280        JP   Z,DUNUBS
60884 2290        CALL SHORT1
60887 2300        JP   Z,UBMCH1
60890 2310        INC  DE
60891 2320        INC  DE
60892 2330        INC  DE
60893 2340        JP   LOOP5
60896 2350 UBMCH1 CALL SHORT2
60899 2360        JP   Z,UBMCH2
60902 2370        INC  DE
60903 2380        INC  DE
60904 2390        JP   LOOP5
60907 2400 UBMCH2 CALL SHORT3
60910 2410        JP   Z,UBFWD
60913 2420        INC  DE
60914 2430        JP   LOOP5
60917 2440 DUNUBS LD   DE,(UCOB)
60921 2450 LOOP6  LD   A,(DE)
60922 2460        CP   255
60924 2470        JP   Z,DUNOBJ
60927 2480        CALL SHORT1
60930 2490        JP   Z,OBMCH1
60933 2500        INC  DE
60934 2510        INC  DE
60935 2520        INC  DE
60936 2530        JP   LOOP6
60939 2540 OBMCH1 CALL SHORT2
60942 2550        JP   Z,OBMCH2
60945 2560        INC  DE
60946 2570        INC  DE
60947 2580        JP   LOOP6
60950 2590 OBMCH2 CALL SHORT3
60953 2600        JP   Z,OBFWD
60956 2610        INC  DE
60957 2620        JP   LOOP6
60960 2630 DUNOBJ LD   DE,(UCFK)
60964 2640 LOOP7  LD   A,(DE)
60965 2650        CP   255
60967 2660        RET  Z
60968 2670        CALL SHORT1
60971 2680        JP   Z,FKMCH1
60974 2690        INC  DE
60975 2700        INC  DE
60976 2710        INC  DE
60977 2720        JP   LOOP7
60980 2730 FKMCH1 CALL SHORT2
60983 2740        JP   Z,FKMCH2
60986 2750        INC  DE
60987 2760        INC  DE
60988 2770        JP   LOOP7
60991 2780 FKMCH2 CALL SHORT3
60994 2790        JP   Z,FKFWD
60997 2800        INC  DE
60998 2810        JP   LOOP7
61001 2820 SHORT1 LD   (TPNO),A
61004 2830        INC  DE
61005 2840        LD   A,(DE)
61006 2850        LD   B,A
61007 2860        LD   A,(CHAR1)
61010 2870        CP   B
61011 2880        RET
61012 2890 SHORT2 INC  DE
61013 2900        LD   A,(DE)
61014 2910        LD   B,A
61015 2920        LD   A,(CHAR2)
61018 2930        CP   B
61019 2940        RET
61020 2950 SHORT3 INC  DE
61021 2960        LD   A,(DE)
61022 2970        LD   B,A
61023 2980        LD   A,(CHAR3)
61026 2990        CP   B
61027 3000        RET
61028 3010 AND    CP   65
61030 3020        RET  NZ
61031 3030        INC  HL
61032 3040        LD   A,(HL)
61033 3050        CP   78
61035 3060        RET  NZ
61036 3070        INC  HL
61037 3080        LD   A,(HL)
61038 3090        CP   68
61040 3100        RET  NZ
61041 3110        CALL SETCOM
61044 3120        LD   A,1
61046 3130        LD   (EXIT),A
61049 3140        DEC  HL
61050 3150        CALL SETPTR
61053 3160        RET
61054 3170 OBFWD  LD   A,(TPNO)
61057 3180        LD   B,A
61058 3190        LD   A,(OB1)
61061 3200        CP   0
61063 3210        RET  Z
61064 3220        CP   B
61065 3230        JP   NZ,OB1DWN
61068 3240        LD   A,B
61069 3250        LD   (OB1),A
61072 3260        RET
61073 3270 OB1DWN LD   A,(OB2)
61076 3280        CP   0
61078 3290        RET  Z
61079 3300        CP   B
61080 3310        RET  Z
61081 3320        LD   A,B
61082 3330        LD   (OB2),A
61085 3340        RET
61086 3350 FKFWD  LD   A,(TPNO)
61089 3360        LD   B,A
61090 3370        LD   A,(FK1)
61093 3380        CP   0
61095 3390        RET  Z
61096 3400        CP   B
61097 3410        JP   NZ,FK1DWN
61100 3420        LD   A,B
61101 3430        LD   (FK1),A
61104 3440        RET
61105 3450 FK1DWN LD   A,(FK2)
61108 3460        CP   0
61110 3470        RET  Z
61111 3480        CP   B
61112 3490        RET  NZ
61113 3500        LD   A,B
61114 3510        LD   (FK2),A
61117 3520        RET
60382 3530 START  EQU  60382
60379 3540 COUNT  EQU  60379
61118 3550 NCOM   DEFW 0
61120 3560 PTR    DEFW 0
61122 3570 TPNO   DEFB 0
61123 3580 MORE   DEFB 0
61124 3590 TELL   DEFB 0
61125 3600 PERS   DEFB 1
61126 3610 UB1    DEFB 0
61127 3620 UB2    DEFB 0
61128 3630 UB3    DEFB 0
61129 3640 FK1    DEFB 0
61130 3650 FK2    DEFB 0
61131 3660 OB1    DEFB 0
61132 3670 OB2    DEFB 0
61133 3680 UCSG   DEFW 0
61135 3690 UCVD   DEFW 0
61137 3700 UCVS   DEFW 0
61139 3710 UCOB   DEFW 0
61141 3720 UCFK   DEFW 0
61143 3730 CHAR1  DEFB 0
61144 3740 CHAR2  DEFB 0
61145 3750 CHAR3  DEFB 0
61146 3760 EXIT   DEFB 0

Pass 2 errors: 00

AND     EE64      CHAR1   EED7
CHAR2   EED8      CHAR3   EED9
COMMA   EC74      COUNT   EBDB
DOUBLE  ED28      DUNOBJ  EE20
DUNUBS  EDF5      END     EC4B
ENDCOM  EC95      EXIT    EEDA
FILTER  EC9A      FK1     EEC9
FK1DWN  EEB1      FK2     EECA
FKFWD   EE9E      FKMCH1  EE34
FKMCH2  EE3F      FWD1    ED4D
INIT    EBF0      LAST    EDA7
LOOP    EC77      LOOP1   ED17
LOOP2   ED37      LOOP3   ED83
LOOP5   EDCE      LOOP6   EDF9
LOOP7   EE24      LOOPA   EC23
MORE    EEC3      NCOM    EEBE
NEWWD   EDA6      OB1     EECB
OB1DWN  EE91      OB2     EECC
OBFWD   EE7E      OBMCH1  EE0B
OBMCH2  EE16      PARSER  EBF0
PERS    EEC5      PTR     EEC0
RESIZE  EC0A      SETCOM  EC8B
SETPTR  ED81      SHORT1  EE49
SHORT2  EE54      SHORT3  EE5C
SINGLE  ED0B      SKIPSP  ECF6
SOB1    EC4F      START   EBDE
SWAP    EC58      TELL    EEC4
TPNO    EEC2      TRIPLE  EDAC
UB1     EEC6      UB1DWN  ED65
UB2     EEC7      UB2DWN  ED74
UB3     EEC8      UBFWD   ED56
UBMCH1  EDE0      UBMCH2  EDEB
UCFK    EED5      UCOB    EED3
UCSG    EECD      UCVD    EECF
UCVS    EED1

Table used:   888 from   860
```

variable PERS is given the value 2 (the number for Fred) corresponding to the person being addressed Note that TELL is really only a flag which takes the value 1 or 0 according to whether speech is signified or not It's the variable PERS which conveys the information about whom the player is trying to speak to.

So why do we need the extra variables on VB2 and OB2? Well, sometimes commands may involve two objects — and there may be instances when you want to distinguish between two slightly different types of action, such as putting objects ON or IN other subjects. Figure 2(c) shows the analysis of the command "PUT THE BOOK IN THE CHEST" See how the two verbs "PUT" (12) and "IN" (7) are picked up here, together with the two objects in order "BOOK" (7) and "CHEST" (8).

The final example, 2(d) is of the type where speech to one person involves some kind of action with yet another person And so the command "ASK PETER TO GIVE THE KNIFE TO JOHN" sets the speech flag (TELL) and sets PERS to 3 ("PETER") As we'd expect, VB1 is 14 ("GIVE") and OB1 is 4 ("KNIFE") but in addition to this, FK1 has picked up the other person involved in the transaction ("JOHN"=4) We see here, by the way, how the separation of nouns into PEOPLE and OBJECTS eases the error checking process needed in every adventure. If a command is found to contain a verb such as "GIVE" or "FIGHT" (where some other person must of necessity be specified) it can be rejected as an unacceptable entry without further enquiry if FK1 is zero. Example 2(d) also illustrates the essential friendliness of VENTURESPEAK, particularly where speech commands are concerned It matters not a jot what style of entry is used by the player — SAY TO PETER "GIVE JOHN THE KNIFE" for example, will be decoded with complete success by the parser

I haven't mentioned how the system copes with multiple commands yet Suppose the command GET THE SWORD AND GO NORTH has been entered The parser will analyse the first part (GET THE SWORD) and then return to BASIC, but it will remember how far along the command it has scanned If we LET MORE=PEEK 61123 (see above), the variable MORE will be assigned the value 1 — telling us in effect that another part of the command remains to be analysed (For single commands MORE will be zero). This means we can arrange for the first command to be processed by an appropriate BASIC subroutine, and then test the variable MORE to see whether another analysis should follow, or whether a return to keyboard control is called for However, the re-entry point to the parser routine is different should a continuation of analysis be necessary — on such occasions the parser is called with LET M=USR 60426 (This is because the usual entry at USR 60000 involves a tidying-up process which would cause the parser to "forget" the position it had reached on its previous scan)

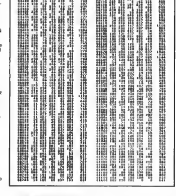
A typical programming "flow chart", therefore, would be something like this

(1) CALL KEYBOARD ROUTINE (USR 60000)
(2) CALL PARSER ROUTINE (USR 60400)
(3) PROCESS COMMAND IN BASIC
(4) "IF MORE THEN LET M=USR 60426" GOTO (3)
(5) GO BACK TO (1)

I hope that by now you've begun to get some idea in principle, of what VENTURESPEAK can do for your adventure writing If you're burning for some "hands on" experience, don't worry You'll be able to try out all these examples (and as many others as you wish) yourself with the help of the EDITOR program next time, when I'll also be offering more detailed explanations of how to incorporate the system into your own programs. Till then

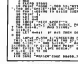
Listing 2

Decimal dump of parser machine code



Listing 3

Machine code loader program



More from the last outpost of ZX81 users.

This month we have great pleasure in handing over the content of this page to two of our readers who wrote in with a couple of useful routines.

The first one is a brilliant addition for our giant REM project and we will be sending both contributors tokens of our appreciation.

Dear Sir,

I have sent you a contribution for your giant REM program. My machine code program will sort a specified character array into alphabetical order in a matter of seconds, eg. A 500 by 10 array in less than 2 seconds. This program is therefore very useful for filling programs.

My routine occupies 151 bytes and is relocatable if 2 addresses are altered. I have included a HEX loader to poke in the machine code and by changing line 100 to the required starting address, the program will automatically alter the two fixed addresses and so relocate the machine code routine.

The routine will only sort two dimensional character arrays and will produce an error code 2 if the variable has not been set up, or an error code 3 if the dimensions of the array are wrong the routine is called from basic by the command

PRINT USR start address, X$

Where X$ represents any character array. It is more convenient to define the variable, SORT, to hold the starting address and so the routine can be called by

PRINT USR SORT, X$

I have also written an example program to demonstrate my routine and this is listed from line 1000 onwards. To use this program simply change start address in line 1010 to the starting address of the routine.

Paul Kecskemety, Cheshunt, Herts.

Listing 1

```
   1 REM 151 CHARACTERSYYYYYYYYY
YYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYY
YYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYY
YYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYY
YYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYY
  10 LET A0="210C8D2360A233A0C
"C81C113E4080232323"EF0220"0234
E2344E0433F40"
  20 LET A0=A0+"234C234623E04330
40E04E3F40AC323C40E5C9C0B5304019
E8E1C80C40DCF240"
  30 LET A0=A0+"E000"8B120CCE13A
3C40A"C8E343F400E0433F40"B8120
90C9E505C3E04332"
  40 LET A0=A0+"4B1A962007231380
708120F5C1B1E1C9C5A8C0E0403D40E0
5B1440C0E0D1B5E0"
  50 LET A0=A0+"A8304CE0A02A1440
E0403D40E0E0323C40E1E1C1C9CF02"
 100 LET START=16514
 110 FOR I=START TO START+150
 120 POKE I,16*CODE A0+CODE A0(I
-476
 130 LET A0=A0(3 TO )
 140 NEXT I
 150 LET J=START+93
 160 POKE START+A0,INT (J/256)
 170 POKE START+59,(J/256-INT (J
/256))*256
 180 LET J=START+112
 190 POKE START+A3,INT (J/256)
 200 POKE START+62,(J/256 INT (J
/256))*256
 210 STOP
1000 REM EXAMPLE PROGRAM
1010 LET SORT=START ADDRESS
1020 DIM E$(10,15)
1030 FOR A=1 TO 10
1040 FOR B=1 TO 15
1050 LET E$(A,B)=CHR$ (INT (RND*
26)+26)
1060 PRINT E$(A,B)
1070 NEXT B
1080 PRINT
1090 NEXT A
1100 PRINT ,,"PRESS A KEY TO SOR
T"
1110 PAUSE 4E4
1120 PRINT USR SORT,E$
1130 CLS
1140 FOR A=1 TO 10
1150 PRINT E$(A)
1160 NEXT A
```

When we started this project we gave a machine code routine for creating a REM line, since then we have many new readers and so this tip should be useful for them.

Dear Sir,

In your July issue, Page 81, you give a program requiring 235 reserved spaces in a REM statement. I have seen programs requiring even more space than this and it can be very boring and slow creating the necessary REM.

The following little listing makes the job much easier and is worth keeping as a stock item on tape.

1 REM — (Followed by exactly 94 zeros)
9 REM
10 LET R = X + 2
20 POKE 16512, INT (R/256)
30 POKE 16511, R — 256* INT (R/256)
40 FOR N = 16514 TO 16511 + R
50 POKE N,28
60 NEXT N

It is quite easy to count the zeros in line 1 as they represent exactly 3 screen lines less 2 positions. 32*3=96. If you want to provide, say, 309 spaces then create 2 more REM lines as duplicates of line 1 by editing line 1 and changing its line number i.e. 1 REM, 2 REM and 3 REM. Each of these will represent 100 spaces. Add 9 zeros to the REM in line 9. Replace the x in line 10 with 309. Run the program and wait a few seconds for the program to run through.

You will find that 1 REM will have disappeared. Delete the rest of the unwanted lines.

To provide say 295 spaces create the same 3 REM lines as explained above (=300 spaces) and then remove 5 zeros from 3 REM, this time replacing x with 295, then RUN.

If zeros are not liked any other character can be used by changing the 28 in line 50 to the code of the desired character.

Yours faithfully,
L.G. Baumann, Cowles Hill, S.A.

PAGE 81

THE DISCOVERY COLUMN

John Wase with advice for Discovery Disc owners.

The Opus disc is notable for its reliability rather than speed in comparison with microdrives. If your principal use of the disc is for storing games, then reliability is probably the main criterion which you applied when you bought it. However in contrast to a tape or a microdrive, a disc drive has the option of random access. In other words, if you specify a program out of fifty or so programs stored on the disc, then the disc operating system will immediately jump to the specified program. As you know, apart from the usual things one stores on tape, the disc system will also store lists of data, like telephone numbers. The Discovery unit is neat in the way it will set up special data files called Random Access Files. In this case it can jump to a specified item in the particular file. So if you just happen to be a tailor, and are storing the measurements of each of your customers' clothes on a separate file, the system allows you to pick out and load the file called "JJones" and then move immediately to, say, his arm or leg size.

Tracks and sectors

How is all this done? Well, the catalogue file occupies the first track on the disc, and the system always reads this first, comparing the information with that typed in (in our case, JJones). When it finds JJones on the catalogue file, it then reads information which tells it which track(s) and which sectors on those tracks are involved in storing the file. Then it knows which part of the disc to go to in order to find this information, which, of course, includes his arm or leg size.

Unfortunately, on the Discovery system, the catalogue file is only big enough to hold 110 records, and to make a living, you might want more than 110 customers. Well, the catalogue file can be expanded. I needed to do this for a specialised filing program, but unfortunately the Opus instruction book was printed before the catalogue file-handling routines were finalised, and in some versions which include instructions, these actually don't work. If you have the later handbook, then the instructions have merely been omitted. The program in Figure 1 (which was obtained from Opus) should be used instead.

The listing

Having defined a function to simplify the reading of two-byte numbers (line 10) the program then asks you to input the drive number concerned and the number of blocks, or sectors (line 20). Line 30 opens the "CAT" channel to stream 0. stream 0 is a "funny" stream that doesn't always report errors. Line 40 then reads from the "CAT" channel and chickens out of more sectors are asked for than there is room. Finally, the new value is printed back to the "CAT" channel and the stream is closed (line 50).

Configuration of a Second Disc

Once you have got hold of the Discovery unit and became familiar with it, you might want to add a second disc unit with a power supply unit and the RAM chip, and you can get yourself almost a megabyte of storage in no time at all, except that when you come to FORMAT the thing, all you get is 175K on the screen when it is catalogued. This is because the internal software, which as emptied itself from the EPROM into the RAM chip hasn't been told that there is a disc of a different configuration in drive 2. There are two ways to tell it, for now that the information is in the RAM instead of the EPROM, it can be altered. One way is to read an appropriately configured disc in the drive, i.e. borrow one from a friend. The internal software detects the configuration, and is altered accordingly. The other is to use a program to do it. Here is a program, direct from Opus, which will do the trick (Figure 2).

This program is constructed on much the same lines as the last. Thus, line 10 defines the familiar function, as before. Line 20 opens stream 0 direct to the Opus RAM, using the "CODE" channel. Line 30 checks the version, the program won't work with the old "Spectrodos" system. Line 40 checks that the RAM has been properly fitted. Lines 50 and 60 use POINT to select an address, read a vector, adjust point and move to the new address, and repeat, so finding the location in which the information is to be stored. In line 70, you input the values for the number of sides (i.e. single or double sided), and the number of tracks (40 or 80). These are then put in the address which has been found (line 80), and the disc is formatted with the appropriate information in the title (line 90). If you have fitted your new disc as drive number 2, then change the "1" in line 90 to "2".

And...

If you have any programs or utilities for the Discovery disc, do send them for this column. We look forward to hearing from you.

Figure 1: Listing of the program to expand the catalogue file on the Opus system.

```
   5 REM program "Expand Cat"
  10 DEF FN a()=CODE INKEY$80+25
6*CODE INKEY$80
  20 INPUT "drive:",d "no of blo
cks",b
  30 CLEAR #0: OPEN #0;" CAT ";d
RND 16: POINT #0;2
  40 LET e=FN a()+0+FN a(): IF b
>e THEN CLEAR #0: OPEN #0;d;"x"
OUT 2^31: STOP
  50 POINT #0;1: RANDOMIZE FN a(
16*FN a()+0: PRINT #0;CHR$ PEEK
23670;CHR$ PEEK 23671;: CLOSE #
0
```

Figure 2: Program to configure a disc

```
   5 REM program "Config"
  10 DEF FN a()=CODE INKEY$80+25
6*CODE INKEY$80
  20 CLEAR #0: OPEN #0;" CODE "
  30 IF USR BC2 1 THEN PRINT "Wr
ong version": STOP
  40 IF USR 16070 THEN PRINT "Ra
m not fitted": STOP
  50 POINT #0;8192: POINT #0;FN
a()+10: POINT #0;FN a()+1
  60 POINT #0;FN a()
  70 INPUT "Tracks (40,80):",t "
Sides (1,2):",s "Insert new disk
and press ENTER": LINE a#
  80 PRINT #0;CHR$ t;CHR$ 15;CHR
$ (65+4*(USR BC2 2)+16*(s=2));
  90 FORMAT 1;STR$ t+" tr,"+STR$
s+" s#"
```

Jewels of Darkness

Peter Sweasey delivers the verdict on the revamped Middle Earth Trilogy.

Jewels of Darkness
Rainbird
£14.95

I very nearly didn't give this game a Monster Hit rating, but in the end I decided that even a below average Level 9 game is better than almost everything on the market. However I'm extremely disappointed with Jewels Of Darkness, not so much for what it is, but because it isn't what it could so easily have been.

The games which form what was previously called the 'middle earth' trilogy are Colossal Cavern, Adventure Quest and Dungeon Adventure. The first is a version of the original mainframe game, with all the traditional puzzles, plus a special endgame where you rescue some elves in a race against time. Adventure Quest takes you, an apprentice magician, across varied terrain in your mission to destroy the Demon Lord. Dungeon Adventure is set just after said nasty's defeat, and sees you as an adventurer looting the treasure-filled caverns beneath his domain. The latter two have an obvious plot link but the first one "feels" very different and doesn't fit in particularly, the only common feature being the same starting point as AQ.

These are all well-crafted, enjoyable adventures, and no matter what I will shortly say this must be borne in mind. They remain impressive for their mass of locations and puzzles, the lengthy descriptions and varied responses (though not as wide-ranging as in Price Of Magik). In their original forms they have rightly become classics, and the versions in Jewels have been technically updated, though the actual games remain basically unchanged. They run faster and look (marginally) better. The sophisticated sentence constructions marvelled at in POM are mostly here too (like DROP ALL EXCEPT). The marvelous type-ahead multi-tasking feature is provided. The originals lacked an EXAMINE command, this has been added, along with other vocabulary dimensions through the additional information that can be gained. The combination of three tapes provides months of entertainment and problems solving for a bargain price. The Jewels of Darkness are a joy to play.

Why then am I not lavishing the games with further praise? It would have been easy for me to go into auto-pilot for this review (Level 9 — must be brilliant), but when looked at closely it contains faults which I would criticise heavily in other games. Though these are minor shortcomings separately, taken together they spoil a potential masterpiece.

Presentation quality is poor. Descriptions, commands and responses are printed in the same yellow on black, with no gaps between them. Everything merges into an untidy mess, particularly if you play the full screen text version, yet this game above all others requires the player to read a tremendous amount. So why no use of a colour, or a more readable character set?

Then we have the 'graphics'. These are so stupefyingly

atrocious, so indescribably inept that I'd laugh if this wasn't a premier product. Just look at the lamentable screenshots we present here. I am not moaning at the inclusion of pictures — I realise they are necessary to gain wide distribution, and enjoy illustrations anyway — but these are so ghostly, no-one could want them. Have fewer of them, and make them mono-tone, if it means higher detail and the creation of something worth looking at. Instead we have blotchy, vague shapes and mindlessly inappropriate colouring (purple trees?). An illustrated version of Colossal offers fascinating possibilities which L9 have completley thrown away. Fortunately, a non-graphics version with expanded text, mostly longer EXAMINE responses, is provided on the other side of the tape (ignore the cassette label which claims that side is for 128 users only — a stupid, unnecessary error).

The games lack RAMSAVE/LOAD, which is fast becoming standard, and should certainly be included in such a major release as this. It is claimed the commands couldn't be fitted in the Spectrum's memory, though many of the versions for other computers include them, and they are tantilisingly mentioned in the instructions. Even if memory was too tight in the graphics version — and seeing as they had no difficulty including the commands in Price Of Magik, this surprises me — why are they not in the text-only version, utilising some of the memory lised by the welcome disposal of the "graphics"? I for one would prefer a few messages not to be expanded in exchange for these useful features. A double punishment is that when you resort to conventional tape storage, which in games this size is frequently necessary, you are forced to use the dreaded Lenslok EVERY TIME! Why not have just one code to crack at the start?

There are other, tiny niggles which all add up. There's no abbreviation for LOOK, unlike virtually every adventure on the market. You are only given a score rating on death; if you type SCORE or QUIT, you are just given a number. If the rating routine is there in memory, why not use it? There are no proper editing facilities, just delete: annoying during long sentences.

Plus, I think more could have been done to update the games themselves. Some independent characters perhaps? And Colossal looks rather hackneyed these days, so some new problems would have been welcome.

Virtually every fault I've outlined is easily corrected. But

they're present, in what should be a particularly professional adventure, as a result of the Rainbird deal. Apart from the packaging, the ST tie-up seems to have had no effect. For example, there is no loading screen, just the same 'Level 9" printed in different colours that has been used for several years. The adventures are good, so why not polish them to perfection? Nothing annoys me more than wasted opportunity.

The attractive packaging is better than most by the way. The instructions are excellent, plus there's a highly readable, entertaining novella, which sets the scene for the latter two games. I expected this to be dull, standard fantasy fare, full of silly names, but it was unexpectedly humorous and gripping. Illustrations would have improved it though.

If you own more than one of these games already, then the revisions are probably insufficient to justify buying Jewels Of Darkness. If you have one or less, or if you are new to the world of adventuring or to the Spectrum, this package represents superb value for money and should keep you occupied for all the coming long, winter nights: perhaps the rest of 1987 as well!

MONSTER HIT

MACHINE CODE

CALCULATOR

Toni Baker rounds off the series with a look at the function generator.

There is just one calculator instruction left to cover. It is the function 'series' otherwise known as the *function generator*, or *series generator*. Its code will be a value between 80h and 9F. The last five bits of the code form a parameter, so that 86h means "series 6", 8C means "series twelve", 99 means "series twenty-five", and so forth. This is the single most powerful instruction in the whole of the calculator set. It is the function with which SIN and EXP and others were written in the ROM. With it we may create our own designer functions, or implement mathematical functions which are not present (and not otherwise possible) on the Spectrum. The "series" function is the calculator's final frontier. Essentially what the "series" instruction does is to evaluate a polynomial expression. "Polynomial" is simply a highbrow piece of mathematical jargon — it means an expression which looks something like this

$$a_1 + a_2 X + a3 X^2 + \ldots + a_n X^{n-1}$$

I apologise to those of you not acquainted with mathematical notation. The same expression written in Spectrum BASIC would be as follows

```
A(1) + A(2)*X + A(3)*X↑2 + . . + A(N)*X↑(N-1)
```

The dots in the middle of the above simply mean "and so on until." If you know the value of N you can fill in the missing chunk and put the whole lot into a single BASIC expression. If you don't know the value of N then you would have to use a FOR/NEXT loop from 1 to N in order to work it all out. But what does it all *mean*? Let's take it apart and find out.

Firstly the number 'n' — this is called the "degree" of the polynomial (technically the degree is n−1, not n). The "series" instruction specifies the number 'n' explicitly, so that, for example, 'series 6' tells us that n equals six; "series 8" would mean that n equals eight. The parameter, which is part of the hex code (bits 4 to 0) actually specifies the degree of the polynomial. You should note that since you only have five bits in which to specify this parameter, its maximum value (other than zero) is hex 1F, or thirty-one. Note also that if you specify n to be zero, the ROM will mistakenly interpret this as two hundred and fifty six.

A polynomial expression such as we have been discussing consists of a number of terms, each separated by a "+" sign. The first term is a_1, and the last term is $a_n x^{n-1}$. In general, the *i*-th term will be $a_i x^{i-1}$. The value of the whole polynomial is therefore the sum of all of its terms. There are n such terms, and each of them contains the variable 'x' (except the first one — this is because in the first term x would have to be raised to the power of zero, and anything to the power of zero is one). Because every term except the first one contains the variable 'x' (and the first term is simply a number to be added), it follows that the whole thing is simply a function of x. In other words — you put in a value for x at one end, and you get a new number out at the other. This is in common with all of the other functions of the Spectrum.

The 'x' in this case is the value at the top of the calculator stack. When the "series" instruction is encountered, the value 'x' is removed from the calculator stack, the expression is evaluated, and the result put back onto the calculator stack in place of the original 'x'.

All we need to know now are the value of the 'a's. You can think of the 'a's as being a BASIC array A() dimensioned up to n, so that the first term is simply A(1), and the last term is A(N) multiplied by x↑(N−1).

Before we look at how to specify the value of the 'A's, let's have a look at how we may use such a polynomial to calculate functions.

Polynomials

Suppose that the value of 'x' is somewhere between minus one and plus one (ie that x is greater than minus one, and less than one) — we can of course ensure this since we already know how to manipulate the calculator stack. If x is zero then the value of the polynomial will simply be a_1, since all of the other terms will be multiplied by zero. If x is non-zero, but still between minus and plus one, then ABS(x^2) will be less than ABS(x), ABS(x^3) will be less than ABS(x^2), and so on. It follows, therefore, that if the A's are all roughly the same size, then each term will be smaller than the last. Furthermore, if the A's themselves also get smaller (ie if ABS(A(2)) is less than ABS(A(1)), ABS(A(3)) is less than ABS(A(2)), and so on) then each term will be smaller still than the last. Indeed it is possible to ensure that the last term is so small, by comparison to the first term, that if any more terms were added it would be outside the limits of the computer's accuracy, and would thus make no more difference. For instance, if A(1) equals 1, and if the last term equals 2^{-64} or less, then the Spectrum would have to round its answer up by simply ignoring the last term.

It is in theory possible to simulate any function whatsoever, provided that x is between minus one and plus one, that each term is suitably smaller than the last (although I can't go into the precise mathematical details of this condition in an article such as this), and that there are an infinite number of terms.

You see, with an infinite number of terms, we can make the polynomial closer and closer to the desired function with each new term. Unfortunately for us, we are only allowed a maximum of thirty one terms altogether. We can get round this problem by ensuring that the polynomial is close enough — it doesn't have to be *exactly* right. As long as the maximum error is smaller than the accuracy possible on the Spectrum, then the polynomial will calculate the function — at least to the limits of Spectrum accuracy.

So how do we work out the 'A's? — Well, mathematicians may care to use Taylor's or Maclaurin's Theorem (which I can't go into here), and everyone else will have to look the values up in books. Almost any A-level maths book (available from your local

library) will tell you what the correct series is to simulate SIN, or EXP, or whatever

For instance, take the function 2↑X. If X is between minus one and plus one then the function can be simulated by the following polynomial. 2↑X is approximately equal to 1 + 0.69314718*X + 0.24022651*X↑2 + 0.055504109*X↑3 + 0.0096181291*X↑4 + 0.0013333558*X↑5 + 0.0001540353*X↑6 + 0.000015252734 *X↑7

(Incidentally — I didn't work out the above numbers — I got them out of a book. I advise you to do the same. Mathematicians are, of course, welcome to work as much out for themselves as they want)

How does this help us? Well — you see we are still restricted to only using values of X between minus one and plus one (note: if you want to use negative numbers on the Spectrum for the above formula you'll have to use "X*X*X*X*X" instead of "X↑5", and so on) This is no good — the Spectrum can calculate EXP(X) for *all* values of X, not just small ones. To find the way round this problem we'll need to do a bit of maths. It's more difficult, but not, I hope, *too* difficult.

Firstly, note that EXP(X) is defined as e↑x, where e = 2.7182818

LET	u = x / (LN 2)
therefore	x = u * (LN 2)
therefore	e↑x = e↑(u*(LN 2))
	= (e↑(LN 2))↑u
	= 2↑u

Now, since u is a floating point number, it must have an integer part, and a fractional part. Thus

LET	i = INT u
LET	f = u — i
therefore	u = i + f
thus we	e↑x = 2↑u
have	= 2↑(i+f)
	= (2↑i) * (2↑f)

Now, since f is a fraction, between zero and one, we *can* use a polynomial to simulate the function. The polynomial I gave earlier may be used to calculate 2↑f. All we need to do now is to multiply the result by 2↑i (where i is an integer). We can do this simply by adding i to the exponent byte of the five-byte form of the number. This is the procedure used by the ROM to calculate EXP for all values of x

Listing 2

```
10 CLS
20 FOR I = 1 TO 255
30 LET X = I/125
40 LET Y = LN FN G (X)
50 LET J = Y*4+10
60 IF J<176 THEN PLOT I,J
70 NEXT I
```

Well, I won't bore you to tears with any more maths, but I hope you can see how ingenious little tricks like the above can be used to ensure that polynomial approximations are only used on numbers between minus one and plus one. Such ingenious little tricks are necessary, because the polynomial formula won't work with numbers outside this range (for instance — the value of SIN(x) is always between —1 and +1, and yet, even if we used 256 terms, there would always be some large value of x for which a_{255} x^{256} was greater than one. Clearly this would be the wrong answer. You *must* devise a means of ensuring that polynomial approximations to functions are always fed with numbers in range —1 to +1)

Instructions

Now — at last — we need to turn our attention to exactly *how* the values for the 'A's are passed to the "series" instruction. They are not specified explicitly — that would be too simple! Instead, we have to work out a new array, which I'll call B(), also dimensioned up to N. It is the values of the 'B's which are passed to the Spectrum. Therefore, our first task, knowing the value of the 'A's, is to work out the values of the 'B's. The BASIC program of Figure One will do this task for us. Don't worry too much about the algorithm used, just take my word for it — it works! (The mathematics required to prove that it works is beyond the scope of this article)

The program of Figure One doesn't print the 'B's in decimal — instead it prints them in the form required by the series instruction, converting them first to five byte form, and then to the compressed form used by the "stk-data" instruction. This form is also used by the "series" instruction

Listing 1

```
10 LET K = 0
20 INPUT "N = ";N
30 PRINT "N = ";N
40 DIM A(N)
50 FOR I = 1 TO N
60 INPUT "A('0)(I) = ";A(I)
70 PRINT "A('0)(I) = ";A(I)
80 NEXT I
90 GO SUB 340
100 PRINT
110 PRINT FN HS(N+128)
120 FOR I = 1 TO N
130 LET K = B(I)
140 LET Q = PEEK 23627 + 256*PEEK 23628
150 FOR C = 3 TO 1 STEP —1
160 IF PEEK (Q+C+2) = 0 THEN NEXT C
170 LET D = PEEK (Q+1)
180 IF D<64 OR D>143 THEN GO TO 210
190 LET D = D — 60 + 64*C
200 GOTO 240
210 LET D = D — 80
220 IF D<0 THEN LET D = D + 256
230 PRINT FN HS(64*C);
240 PRINT FN HS(D);
250 FOR J = 0 TO C
260 PRINT FN HS(PEEK (Q+J+2))
270 NEXT J
280 PRINT
290 NEXT I
300 STOP
310 DEF FN HS(A) = FN KS(INT (A/16))
    + FN KS(A—16*INT (A/16)) + " "
320 DEF FN KS(A) = "0123456789ABCDEF"(A+1)
330 REM CALCULATES VALUES SUBROUTINE
340 DIM B(N)
350 FOR A = 1 TO N
360 FOR B = 1+N—A TO N STEP 2
370 LET X = B—1
380 GO SUB 520
390 LET J = Y
400 LET X = (A+B—N—1)/2
410 GO SUB 520
420 LET J = J/Y
430 LET X = (B—A+N—1)/2
440 GO SUB 520
450 LET J = J/Y
460 LET J = J*2↑(1—B)
470 LET B(A) = B(A) + J*A(B)
480 NEXT B
490 NEXT A
500 RETURN
510 REM LET Y = X FACTORIAL
520 LET Y = 1
530 FOR I = 1 TO X
540 LET Y = Y*I
550 NEXT I
560 RETURN
```

Gamma Function

```
BASIC
DEF FN G(X) = USR gamma_fn
The number following the keyword USR should be the address of the label GAMMA_FN
in the machine code program.

MACHINE CODE
RT      GAMMA       RST 28          x
C5                  store M5        (M5 contains x)
31                  duplicate       x,x
31                  duplicate       x,x,x
27                  int             x,x,INT x
03                  subtract        x,x-INT x
31                  duplicate       x,x-INT x,x-INT x
A2                  const half      x,x-INT x,x-INT x,1/2
03                  subtract        x,x-INT x,x-INT x-1/2
37                  gt zero         x,x-INT x,x-INT x> 1/2?
0066                jump true,G_HALF x,x-INT x
89                  series 9
E41E8A8F05          ,0001401107i
```

```
E7C6C2F9        -.0015119361
BA0BCBC1A5      .008655251E
BC8C3556A5      -.034230555
BE5AE5857E      0.10651722
BF8634AD75      -0.26211779
F0182375BD      0.59746807
F0BA14CB2B      -0.81457996
F17FBCCB17      1.9502236

                                z,GAMMA(z+1-INT z)
01              exchange        GAMMA(z+1-INT z),z
27              int             GAMMA(z+1-INT z),INT x
A1              const one       GAMMA(z+1-INT z),INT x,1
03              subtract        GAMMA(z+1-INT z),INT(x)-1
31              duplicate       GAMMA(z+1-INT z),INT(x)-1,INT(x)-1
30              eq zero         GAMMA(z+1-INT z),INT(x)-1,INT(x)=0
0817            jump true,G_1_TO_2  (Jump if INT(x) =0, ie if x is between
                                    one and two).

                                GAMMA(z+1-INT z),INT(x)-1
31              duplicate       GAMMA(z+1-INT z),INT(x)-1,INT(x)-1
36              lt zero         GAMMA(z+1-INT z),INT(x)-1,INT x<1
0817            jump true,G_LT_1  (Jump if INT(x)<1, ie if x<1).

The following deals with the remaining case, ie if x is greater than or equal to two.

38              end calc        GAMMA(z+1-INT x),INT(x)-1
C0052B          CALL FP_TO_A    A:= INT(x)-1
47              LD B,A          B:= INT(x)-1
NF              RST 28          GAMMA(z+1-INT z)
A1              const one       GAMMA(z+1-INT z),1

At each pass around the following loop, the topmost item on the calculator stack is assumed to be the "product-so-far", which I shall refer to as $P_B$. At any stage this will actually be the product z(x-1)(x-2)... to INT(x)-1-B terms. In addition, memory five will contain z-INT(x)+B+1.

                                GAMMA(z+1-INT x),$P_B$
05      G_LOOP_1        recall M5   GAMMA(z+1-INT x),$P_B$,z-INT(z)+B+1
A1              const one       GAMMA(z+1-INT z),$P_B$,z-INT(z)+B+1,1
03              subtract        GAMMA(z+1-INT z),$P_B$,z-INT(z)+B
C5              store M5
04              multiply        GAMMA(z+1-INT z),$P_{B-1}$
35FA            djnz G_LOOP_1   GAMMA(z+1-INT z),$P_0$

At this stage the topmost item on the calculator stack is z(x-1)(x-2)(x-3)...K, where K is less than two (but greater than or equal to one).

04              multiply        GAMMA(z)
38              end calc
C9              RET             Return with current value on calc stack.

The following applies for the case INT(x)=1. Note that since INT(x)=1 it follows that GAMMA(z+1-INT z) actually equals GAMMA(z), and that INT(z)=1 equals zero.

02              RST 28          GAMMA(z),0
02      G_1_TO_2        delete  GAMMA(z)
38              end calc
C9              RET             Return with correct value on calc stack.

The following deals with the case where x is less than one.

NF              RST 28          GAMMA(z+1-INT z),INT(z)=1
18      G_LT_1          negate  GAMMA(z+1-INT z),1-INT x
38              end calc
C0052B          CALL FP_TO_A    A:= 1-INT x
```

▶ ▶ ▶

In other words, if you input the A's — which technically are the coefficients of a power series (don't worry if you don't understand the terms), then the program will miraculously transform the numbers into a new set of numbers — those used by the "series" instruction. The program leaves no work to you at all. The output of the program is the complete series instruction (in hex) required to evaluate the required polynomial, including the initial "series" byte. For extra clarity, you could, if you so desired, add an extra BASIC line at 285 PRINT B(1) which would show you the B's in decimal as well as in hex.

If you now feed the bytes printed on the screen into a calculator program, then hey presto — your function will be operational!

Gamma

We shall demonstrate this procedure now by introducing a brand new function to Spectrum BASIC. It will be referred to in BASIC as FN G() but the function will be defined mathematically as the GAMMA FUNCTION. It is very similar to the FACTORIAL function described last month, in that GAMMA(x) equals FACTORIAL(x—1) for all positive integer values of x, but whereas FACTORIAL only works for integers, GAMMA works for *all* numbers. A graph drawn of Y = GAMMA(x) will form a smooth continuous curve, and for all values of x it is true that GAMMA(x+1) equals x*GAMMA(x).

Furthermore, I shall go through, in detail, the process by which the function is being created. First of all we need a polynomial. I came across such a polynomial approximation in the book "Mathematical Methods in the Physical Sciences" by Merle C. Potter. The polynomial is only valid if x is between 0 and 1, but is more accurate if x is near zero. For this reason I have chosen only to use values of x between 0 and ½. The polynomial calculates the value of GAMMA(x+1) if x is in this range. The polynomial is as follows:

$$\text{GAMMA}(x+1) = 1 - 0.577191652x + 0.988205894x^2 - 0.897056937x^3 + 0.918206857x^4 - 0.756704078x^5 + 0.482199394x^6 - 0.193527818x^7 + 0.035868343x^8$$

Now, as I have said, I want to make sure that the polynomial is only used for values of x between 0 and ½, and yet I want the GAMMA function, FN G() to work for all values of x, so we must find a way around this problem.

Firstly, we can make use of the rule GAMMA(x+1) equals x*GAMMA(x). We can use the rule repeatedly (in a loop) to reach any value of x, so long as the fractional part (the part to the right of the decimal point) is no greater than a half. For these remaining numbers we can use a different mathematical rule, for all x, GAMMA(x)*GAMMA(1—x) = PI/SIN(x*PI)

The first step, then, is to convert the polynomial into a "series" instruction. To do this we simply run the BASIC program of Figure One, and input 9 (because there are nine terms), and then input the nine numbers (1, —0.577191652, and so on). The program will print out the required form of the "series 9" instructions, which you will find incorporated into the main machine code program accompanying this article. The rest of it is just a hard slog, isolating the various cases, and dealing with them accordingly.

Incidentally, although I have used a loop to implement the GAMMA(x+1) = x*GAMMA(x) rule, this is not the only way of doing things. Another way would have been to call the GAMMA subroutine recursively (ie from within itself). I decided not to use this method because it would use up more memory on the calculator stack (an additional five bytes for each recursive call), but if you feel that that would not be too much of a disadvantage you might like to rewrite the routine using this method.

Finally, the proof of the pudding is in the eating. The final test is whether or not it works. One way we can check is to calculate GAMMA(½) — the answer should come out to be SQR(PI). The best way to check, however, is to plot a graph. The function should produce a smooth continuous curve. The BASIC program of figure two will plot such a graph, and I will leave it to you to draw your own conclusions from it.

Well that's it from me for this series. We have now covered everything the calculator can do (or have we?). We have covered every single calculator instruction possible (or have we?). This now concludes our series. I hope you have enjoyed reading it. Good programming, and may the force be with you.

(But — just a thought — what would happen if you used "invalid" calculator codes? codes between 3E and 7F? With code 43h for instance, control could be directed into RAM, and enable the use of user-defined calculator instructions — defined in machine code of course. Interesting? Maybe one day the saga may continue ... But not for the moment)

```
47                      LD B,A              B:= 1-INT x
BF                      RST 28              GAMMA(x+1-INT x)
A1                      const one           GAMMA(x+1-INT x),1

At each pass around the following loop, the topmost item on the calculator stack is
assumed to be the "product-so-far", which I shall refer to as P_b. At any stage this
will actually be the product (x+1)(x+2)(x+3)... to 1-INT(x)-B terms. In addition,
memory five will contain x+1-INT(x)-B.

                                            GAMMA(x+1-INT x),P_b
E5      G_LOOP_2        recallI M5          GAMMA(x+1-INT x),P_b,x+1-INT(x)-B
31                      duplicate           GAMMA(x+1-INT x),P_b,x+1-INT(x)-B,x+1-INT(x)-B
A1                      const one           GAMMA(x+1-INT x),P_b,x+1-INT(x)-B,x+1-INT(x)-B,1
0F                      add                 GAMMA(x+1-INT x),P_b,x+1-INT(x)-B,x+2-INT(x)-B
C5                      store M5
02                      delete              GAMMA(x+1-INT x),P_b,x+1-INT(x)-B
04                      multiply            GAMMA(x+1-INT x),P_b-1
35F8                    djnz G_LOOP_2       GAMMA(x+1-INT x),P_0

At this stage the topmost item on the calculator stack is (x+1)(x+2)(x+3)...K,
where K is less than one, but greater than or equal to zero.

D5                      divide              GAMMA(x)
38                      end calc
C9                      RET                 Return with correct value on calc stack.

Finally, note that numbers such that x-INT(x)> 1/2 are dealt with separately, for greater
accuracy. These are numbers such as  -1.5 to -1; -0.5 to 0; 0.5 to 1; 1.5 to 2; and so
on.

EF                      RST 28              x,x-INT x
02      G_HALF          delete              x
31                      duplicate           x,x
A1                      const one           x,x,1
01                      exchange            x,1,x
03                      subtract            x,1-x
38                      end calc            x,1-x
CD????                  CALL GAMMA          Call the GAMMA subroutine recursively.
EF                      RST 28              x,GAMMA(1-x)
01                      exchange            GAMMA(1-x),x
A3                      const pi/2          GAMMA(1-x),x,PI/2
38                      end calc
34                      INC (HL)            GAMMA(1-x),x,PI
EF                      RST 28
C4                      store M4            (M4 contains PI)
04                      multiply            GAMMA(1-x),x*PI
1F                      sin                 GAMMA(1-x),SIN(x*PI)
04                      mult                GAMMA(1-x)*SIN(x*PI)
E4                      recallI M4          GAMMA(1-x)*SIN(x*PI),PI
01                      exchange            PI,GAMMA(1-x)*SIN(x*PI)
D5                      divide              PI/(GAMMA(1-x)*SIN(x*PI))
38                      end calc            GAMMA(x)
C9                      RET

It can be shown algebraicly that PI/(GAMMA(1-x)*SIN(x*PI)) is equal to GAMMA(x). The
proof of this is beyond the scope of this article, however I have made use of this
fact to ensure maximum accuracy. It means that the "series" instruction is only ever
passed values of x between zero and half. The last part of the program links the
machine code to the BASIC RSF FN G statement.

2A0B5C  GAMMA_FN        LD HL,(DEFADD)      Point HL to user-define function record.
23                      INC HL
23                      INC HL              HL: points to 5-byte form of 'x'.
CDD433                  CALL STACK_NUM      Place x on calculator stack.
CD????                  CALL GAMMA          Calculate GAMMA(x).
C1                      POP BC              Delete STACK_BC address from machine stack.
C9                      RET
```

● ● ●

ZX COMPUTING

FULL CREDIT FACILITIES FOR ACCESS AND BARCLAYCARD.

Lineage: 46p per word (VAT inclusive)

Semi display: £9.50 per single column centimetre + VAT. Ring for information on series bookings/ discounts (minimum 2.5cm)

All advertisements in this section must be prepaid
Advertisements are accepted subject to the terms and conditions printed on the advertisement rate card (available on request)

01 - 437 0699

Send your requirements to:
DUNCAN NEILSON
ASP Ltd., 1 Golden Square,
London W1

SOFTWARE

WD Software

FOR THE QL

JOSS — **base £15**
Forget that tedious time-consuming syntax. Just move the cursor and press SPACE for a new line command. Cursor keys or your joystick allow you to access microdrives (up to 3). And Beepy is on (as many as our interface allows) with up to 150 lines on each Scroll and print directly use COPY DELETE or PRINT any file select TV or Monitor mode halfway LOADing or RUNning any program. You only use the keyboard to set the DATE or label a drive when FORMATting. Easy to use with Psion and other software. No play (cons to learn. JOSS will TELL you what it's going to do! Programmer's Toolkit and more copying/ printing utilities also supplied. Specify microdrive-only. Microperipheral or CST compatible disc version.

Ref QL7 — **base £7**
1380 useful QL references with ARCHIVE 2 search/print program. Too long for just one cartridge, so if you have RefQL5 just copy 2 and extra module need to update.

Mdv Extension Cable — **£5.90**
Eight inches long at your side of an extra microdrive lives to your QL. Twist it to suit the rest of the living you.

FOR THE QL, SPECTRUM, BBC, ELECTRON

WD Morse Tutor — **base £4**
Written to teach amateurs now used by professionals too! Absolute beginner or stretching your speed to 18 wpm you won't find anything with more helpful features. What else can offer 100 random sentences as well as all the basics? Disc vers on also available for BBC B+

FOR THE SPECTRUM

WordFinder (Microdrive/disc only) — **base £8**
For CHEATING at crosswords. Finds multi-letter, header, anagrams. 15-letter word vocabulary so too long to show a cartridge. 10-letter word ending in ATE? No problem.

Tradewind — **base £3**
Sailing trading strategy game with graphic surprises.

Jersey Quest — **base £3**
Text adventure in time. Background of Jersey folklore from Stone Age to Bergerac.

For export
QL hardware and software from many other co. Ask for free quotation.

ORDERING AND COST OF MEDIUM. POSTAGE £1 OUTSIDE EUROPE.
Mdv or 5.25" floppy £2 3.5" floppy £4 Cassette + £0

Payment
By ACCESS/Eurocard/MasterCard or STERLING (UK bank cheque, Eurocheques (make out internal and GIRO). To

WD Software (ZX), Hilltop, St. Mary, Jersey, C.I. tel: (0534) 81982

UTILITIES

SPECTRUM TAPE and DRIVE TRANSFER UTILITIES

TUB — ESSENTIAL for ALL Spectrum 48K or Plus owners — our tape utility for backup and drive conversion

- Simple operation for fast loaders — accurate even if over 48K (tone and tape measure)
- Integrated header/leader manager handle/erase blocks.
- Deals with chaky headers — converts COMPLETELY to header for type Read (plus many more transfer with TPS)

Plus many other features — a unique product!

COST only £6.90 on tape OR £7.95 on m/drive cart.

TRANSFER PACK 2 — FOR TAPE TO DRIVE TRANSFER

Package of programs including TUB, other utilities, shows drive transfer of many programs

- Details given on transfer of 40 programs.
- Manages virtually all chaky loaders. Bypass cheaper/better header/leader etc.

State name of drive system (e.g. m/drive, Opus disc, etc)

ONLY £11.90 on tape OR £12.90 on m/drive cart

INFORMATION SHEETS £1 each (up to No. 18 available) includes many top 20 hits — SAE for list. OVERSEAS add £1. Europe £2 airmail for each. UPDATE SERVICE — SAE for details.
PROGRAMS CARRY OUT MONEY BACK GUARANTEE (not updates)

LERM, DEPT ZX, 11 BEACONSFIELD CLOSE, WHITELEY BAY, TYNE AND WEAR NE25 9UW

EASTMON

Monitor/Disassembler

Disassembles and steps in RAM ROM & IFT with HARD COPY. Skip or execute. CALLS. Hex and Character entry. Block moves and fills. Clear manual, simple commands. SPECTRUM 48 and SPECTRUM+ £4.99 inclusive.

MYLNHURST ELECTRONICS LTD
86 Eastern Way, Ponteland, NE20 9RE
Tel. Ponteland (0661) 24065

ACCESSORIES

SPECTRUM RESET SWITCH – Prevents damage to your computer when power plug pulled in and out. **Only £3.49 inclusive** Cheque or P.O. to Central Electronics, St Andrews St, Greenock PA15 1HG. Other accessories. Write for free list.

ZX 81 REVISITED! Factsheets Software. A.Z.V.C. Club etc. Send SAE to ACV 1 Foxwell Square, Southfields, Northampton NN3 5AT

QL/SPECTRUM UTILITIES! Wide range of business/practical programs available. SAE/IRC for details (state Micro). SD Micro systems (ZX) PO Box 24, Hitchin, Herts

ZX81/16K I CHING. Draws first three hexagrams, prints results. Cheque £2.99. Eric Rosenbaum, PO Box 2155, Jenkintown, Pa 19046, USA. Postpaid. Source Listing

PROOPS

TOTYENHAM COURT RD
ZX 81 LEARNING AID

A cassette based guide to a programming the Sinclair ZX81 Microcomputer. It allows learning on the machine and *through* the machine. The package comprises a 160-page manual and 6 cassettes. There are 20 programs each demonstrating a particular aspect of ZX81 programming, spread over 6 cassettes. The other 2 are blank practice cassettes.
PLEASE SEND £4.50 (plus £1.75 c/p)

PROOPS
BROTHERS LIMITED
82 Tottenham Court Road, London W1P 0BA
Telephone 01 636 4420

ACCESSORIES

RGB OUTPUT ?
COMPOSITE VIDEO ?
GREEN SCREEN ?
TTL - ANALOGUE ?
COMP SYNC ?
BRIGHT ?

adopt electronics

CONFUSING ISN'T IT?

Take all the problem solvers. We have the experience plus expertise to advise on all aspects of computer display problems eg.

★ **RGB OUTPUT MODULE** for Spectrum 16 or 48K. Much acclaimed — gives monitor quality pictures — no dot crawl. £29.95

★ **NEW ★ BRIGHT BOX** — Allows full use of the bright facility on multiplug input monitors and monitor TV's to produce full eight colour palette. Only for Spectrum 128. £29.95

Add P&P £1 (UK) £2 (EEC) £4 (Others)
Send SAE for our Free Monitor Fact Sheet

20 STADIUM CLOSE, HOCKNORT HILL, ESSEX SS5 5TH. Tel: 01-866 2948

WARNING NOTICE

Advertisements placed in this magazine are to be in strict compliance with our standard conditions (copies of which conditions are available on request) and on the clear understanding that the advertiser warrants that his advertisement(s) does not infringe any copyright or condition of sale of any interested party in the advertised product.

Further, the advertiser indemnifies the proprietors of this magazine in respect of costs, damages, or any other claims brought against them as a result of legal action arising from the publication of the advertisement.

Any breach of these terms or the said conditions may result in prosecution of the advertiser by the proprietors.

UTILITIES

LETTA-HEAD PLUS

[illegible]

DUMPY 3.0

[illegible]

LIN-O-TYPE

[illegible]

ASTRUM+

[illegible]

Bradway Software (ZX), 33, Conalan Avenue, Sheffield, S17 4PG

REPAIRS

SINCLAIR REPAIRS

SPECTRUM/PLUS £12.00
KEYBOARD £8.50
INTERFACE/MICRODRIVE £17.00 each

All prices are fully inclusive of p&p and VAT. Send Cheque with computer only unless power supply suspected. Callers Welcome

I.T. WESTERN ELECTRONICS
Unit F2A & F3
Avenside Enterprise Park
Rainoughton Road
Melksham, Wilts
Tele (0225) 705017

COMPUTER REPAIRS

We are the experts. Always on the [illegible] computers since the introduction of the ZX80.

Don't fall! money on estimates - we repair Sinclair computers at pre-quoted inclusive parts, fault repairs. VAT, postpaid and if fault, fit custom charged.

Money guaranteed for 3 months.

Spectrum £19.75 inc parts
ZX81 £11.50 inc parts
16 fault £9.95 inc parts
Microdrive £15.95 inc parts
Interface 1/11 £16.75 inc parts
also
ZX Microdrive £20.00 + parts
Interface £19.95 + parts
16K Memory Expansion Kit £15.95

Spectrum Retailers please phone for Special Trade Prices

Sold or repaired with cheque or P.O.
V.P. Services of Cambridge Ltd.
French's Road, Cambridge, CB4 3NP
Tel. (0223) 311371

SCOTLAND'S No 1

For home and personal computer repairs Ideally last Spectrum service!

- Same day turnaround faults
- 1 fault / 1 delivered personally
- Open 6 days a week
- Free estimates
- Upgrades, extra memory and P.O.A.
- 3 mth warranty on work done
- Approved by all major PERIPHERALS

MICRO-SERV
95 Dwerbykes View
Westhall Industrial Area
Cumbernauld G68 9HN
Scotland
Tel Cumbernauld (02367) 37190
Trade enquiries and club discount given

SPECTRUM REPAIRS

£14.95 inclusive of labour parts and p&p.
Fast reliable service by qualified engs average repairs **24hrs 3 mnths guarantee**. For help or advice ring
H. S. Computer Services, Unit 2, The Orchard, Warton, Preston, Lancashire PR4 1BE. Tel (0772) 632686.

SINCLAIR COMPUTER REPAIRS

All machines despatched within 72 hours of receipt
Spectrum £17.00 ZX 81 £12.50
Spectrum 16 to 48K upgrade £25.00 (inc parts, VAT and return postage)
For a fast and reliable service send machine, brief description of fault and cheque or postal order to the experts
Capitol Computer Services
Unit K2 Cardiff Workshops, Lewis Rd, East Moors, Cardiff CF1 5ED
Tel (0222) 481801

SINCLAIR SERVICE CENTRE

- Fully Guaranteed Fast Repair Service
- Approx. 24hr Turnaround
- £15 inc mail or send machine with £1.95 (return p&p) for free estimate
- Personal callers welcome

QUANTUM
33 CITY ARCADE, COVENTRY CV1 3HX
Tel: (0203) 24632

SPECTRUM REPAIRS

We expertly repair Spectrums for £17 inclusive of parts and labour and return postage

Spectrums upgraded to 48K for £34 inc P&P. All keyboard faults cost only £12

R. A. Electronics
133 London Road South, Lowestoft, Suffolk
Tel. (0502) 66280

To advertise your repairs & spares service phone 01-437 0699

CLUBS

VIDEO INFORMATION

Join the Video Information Club and receive information about all aspects of your video hobby. Free technical advice, video exchange, rare car discounts on video, hardware, games, etc. Regular Club Newsletter, International Cleaning House facility, Membership Unit, Advertising, Group Car stickers, etc. to Membership Card. ALL FREE. Just ring

0898 100 430

And Just Listen to the Tape
(48p per minute peak, 36p off peak) (Jersey services)

DISK DRIVES

ZX-81 DISK DRIVE CONTROLLER BOARD

Powerful DOS supports basic programs, Blocks and Arrays
Uses Double sided 5¼, Disk Drive
100K bytes per disk
Easy to use DOS. Many extra features
Disk buffers Enquire
LARKEN ELECTRONICS
RR 2, NAVAN, ONTARIO
CANADA K4B 1H8 £70 + SHIPPING

FOR SALE

FOR SALE one year old Spectrum plus assorted software, tape recorder, interface 2. £80.00. Tel Mark on (01) 740 8602

Lineage rate 48p per word (VAT inc.) Minimum £7.20
Semi display £9.50 per single column centimetre + VAT. Minimum size 2cm. No reimbursements for cancellations
All ads must be pre paid
Write your advert in BLOCK CAPITALS in the grid below, ticking the section you wish it to appear under, INCLUDING YOUR NAME AND ADDRESS IN THE WORD COUNT and send it to **ZX COMPUTING, ADVERTISEMENT DEPARTMENT, NO. 1 GOLDEN SQUARE, LONDON W1R 3AB.**

☐ REPAIRS ☐ SOFTWARE ☐ UTILITIES ☐ FOR SALE ☐ ACCESSORIES ☐ OTHERWISE PLEASE STATE

CLASSIFIED COUPON

ALL CLASSIFIED ADVERTISEMENTS MUST BE PRE-PAID
THERE ARE NO REIMBURSEMENTS FOR CANCELLATIONS

I enclose my Cheque/Postal Order for £ ..... for insertions made payable to Argus Specialist Publications (Delete as necessary)

PLEASE DEBIT MY ACCESS/BARCLAYCARD NO

£ ..... FOR ..... INSERTIONS EXPIRY DATE

Name .....
Address .....
..... POST CODE .....
DAYTIME TEL NO .....
Signature ..... Date .....

IF YOU DO NOT WISH TO CUT YOUR MAGAZINE, PHOTOCOPY THIS FORM

UTILITIES

Ray Elder examines a combined monitor/disassembler and a DIY poster maker.

EASTMON MONITOR/DISASSEMBLER
Eastway Systems
£4.99

This is an unusual and unexpected program, a "stand alone" Monitor/Disassembler Usually these are produced as a support program for a company's assembler, and there is also the fact that there are already several on the market for the ageing Spectrum

With this in mind the program must stand on whether it is easy to use and any special features it has.

Taking the latter first Eastmon make a big thing about the fact that the DEFB's following a RST28 command are correctly interpreted (the 'use the calculator' command as Toni Baker's fans will know) It also correctly copes with the Interface 1 RST's.

You may or may not find this important, its useful to know that it if cope though especially if you use them a lot

The program comes complete with a comprehensive, wordprocessed, dot matrix printed fourteen page manual It's all in there, but if your eyesight is not 20/20 then you may have problems with the tightly packed text

Yep, it's easy to use and all the features that you are likely to need have been included, full printouts to any type of printer system and full details of the state of all registers at each step

There is a choice of output either a straightforward address, code, mnemonic print or a full frontal, everything exposed, printout in minute detail.

It may be late in arriving but it certainly does not suffer in comparison with established existing monitors. If you haven't got one and you spend a lot of time programming in machine code then this is highly recommended, it will certainly provide you with the information needed to track down that elusive bug, even in RST28 sections!

Contact Mylnhurst Electronics Ltd 86 Eastern Way Darros Hall, Ponteland, Newcastle-upon-Tyne.

POSTER MACHINE
Softcat Micros
£5.95

Poster Machine is a versatile program which allows you to print screen pictures using most of the popular interfaces and a dot matrix printer

This picture can be in one of eight predefined sizes from 3 25x2 5 inches to 69x60 feet, or in sections to produce really huge copies if that's not enough — though it is likely to be expensive in terms of printer ribbons!

Apart from working with most interfaces, ZXPRINT 3, KEMPSTON E etc (we tried it with them and it worked fine) the program provides options to invert the printed screen or add 'texture' in coloured sections to the copy

You cannot create screens or pictures with it these have to be generated by another graphics package such as their own excellent ANIMATOR1 In fact I would go so far as to suggest that it was developed as companion to this program and its more general application led them to market it separately

This is a simple and easy program to use and includes microdrive options, the only real difficulty came when fiddling with the expanded sections of a picture for the jumbo prints, but this isn't really a job you're likely to do too often anyway

Really it would be more appropriately named Screen$ Printer but I have no quibbles and if you need the specialist functions of flexible screen$ printing then this is the best I have seen (so far)

NB Poster Machine is being supplied free with Animator1 for a short time for £9 95, a good buy

GLIDER RIDER

Trained to kill, you must penetrate the defenses of Abraxas, destroy the terrorist H.Q. and glide to safety.

In case of difficulty Glider Rider can be obtained from Quicksilva Ltd., Units 1 and 2, Conlon Developments, Watery Lane, Darwen, Lancs BB3 2ET

QUICKSILVA

Quicksilva Ltd., Victory House
Leicester Place,
London WC2H 7NB
Tel: 01-439 0666

A MISSION YOU CAN NEVER COMPLETE?

GALVAN

GOLDEN COIN-OP

Hot Shot

Imagine

the game of the game

SPECTRUM £7.95 SPECTRUM

AMSTRAD £8.95 COMMODORE 64

Imagine Software (1984) Limited
6 Central Street · Manchester M2 5NS
Tel: 061 834 3939 · Telex: 669977